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SPICE
Social cohesion, Participation, and Inclusion through Cultural Engagement

D7.5 CASE STUDIES PROGRESS AND PLAN

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SPICE consortium

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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

This document describes the development of the five (5) Case Studies in relation to the Design as well as the Research and Development Activities since the beginning of the SPICE project. It builds on a framework laid out for the Work Packages and Case Studies in the evaluation protocols (D7.1) and the socio-technical roadmap (D7.2, D7.4) as well as the previous annual report on the Case Studies' progress and plan (D7.3). The persona profiles and user-experience maps developed in each Case Study are described here. This report analyses the co-designed activities conducted by the case studies with their end-user communities and museum stakeholders as well as those conducted with the Work Packages targeting the Case Studies. Up till the culmination of the project, the proposed workshops, and activities to be held with the museums' mediators and end-user communities are outlined. Each Case Study is examined based on its pilot's user-experience, human behavior, and heritage experiences towards its end-user communities. The Case Studies' progress, plan, and proposed roadmap outlining future co-designed activities is presented.

Document History

Version	Release date	Summary of changes	Author(s) - Institution
V0.1	31/03/2022	First draft released	Aalto
V0.2	11/04/2022	Contributions by other partners ready for internal review	Aalto, DMH, AAU, OU, IMMA, PG, UNITO, FTM, UH
V0.3	21/04/2022	Internal review comments	Aalto, DMH, AAU, OU, IMMA, PG, UNITO, FTM, UH
V1.0	26/04/2022	Final version in response to the internal reviews	Aalto, DMH, AAU, OU, IMMA, PG, UNITO, FTM, UH

List of abbreviations and terms

- Attention-Deficit/Hyperactivity Disorder (ADHD)
- AI – Artificial Intelligence
- AR – Augmented Reality
- CoI – Communities of Interest
- CoP – Communities of Practice
- DMH – Design Museum Helsinki
- eCAALYX – Enhanced Complete Ambient Assisted Living Experiment
- GAM – Galleria D'Arte Moderna
- GDPR – General Data Protection Regulation
- GUI – Graphical User Interface
- HCD – Human Centred Design
- HCI – Human Computer Interaction
- HECHT – Hecht Museum
- IMMA – Irish Museum of Modern Art
- LDH – Linked Data Hub
- LGBTQ – Lesbian, Gay, Bisexual, Transgender, and Queer.
- MNCN – Museo Nacional De Ciencias Naturales
- PM tool – Project Management tool that will be used by WP7 for communication between the Case Studies and WPs to keep track of tasks and requirements.
- SSA – SPICE Semantic Annotator
- STS – Sociotechnical systems
- URL – Uniform Resource Locator
- UX – User Experience
- VR – Virtual Reality
- WP – Work Package

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1 – INTRODUCTION TO THE CASE STUDIES

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 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 and they include:

- Design Museum, Helsinki (DMH), Finland
- Irish Museum of Modern Art (IMMA), Dublin, Ireland
- Hecht Museum (HECHT), 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.

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

Table 1: Case studies with their short name.

WP7 is coordinating with the Case Studies the course of their development to integrate exploration, development, use and testing of tools and methods for citizen curation. The timeline in Table 2 below illustrates the deliverables of WP7 and the case study activities; the current stage of the timeline is also highlighted in green.

DELIVERABLE (WP7)	DELIVERABLE	DUE DATE (IN MONTHS)
D7.1	Evaluation methods and protocols.	6
D7.2	Socio-technical (STS) roadmap with project management (PM) 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.

Bonding and bridging capital

Each Case Study is focused on researching how methods and tools for citizen curation can facilitate inclusion and social cohesion. This is carried out using via codesign wherein an approach to inclusion is implemented so that excluded groups and other citizens can for example engage with artefacts, create stories, and express opinions. These types of contributions help to build the bonding capital within diverse groups. Similarly, the accumulated interpretations and reflections can be interconnected and shared to build the bridging capital which helps in promoting tolerance and thereby facilitating social cohesion. The bonding and bridging capital in each Case Study is described in Table 3 below.

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.
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.
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 to find similarities as well as respect and understand differences.
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.
MNCN	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 anonymized contributions available across groups to explore differences of opinion on biodiversity and what individuals can and should do to protect the environment.

Table 3: Bonding and bridging capital of the Case Studies.[1]

The current deliverable (D7.5) describes the progress of development of the Case Studies in Period 3 and early months of Period 4 (see Fig.15) as well as further elaborates future progress. Developments prior to these periods have also been reported in the other deliverables (D7.1 – Evaluation Protocols, D7.2 – Socio-technical Roadmap with Project Management Tool, D7.3 – Case Studies Progress and Plan, and D7.4 – Socio-technical Roadmap with Project Management Tool)

[1] These descriptions about the bonding and bridging capital have been derived from the project's grant agreement.

along with the evaluation protocols and the role in the socio-technical roadmap. The next chapter provides a summary of the case studies' progress reported in the previous (D7.1 – Evaluation Protocols, D7.2 – Socio-technical Roadmap with Project Management Tool, D7.3 – Case Studies Progress and Plan, and D7.4 – Socio-technical Roadmap with Project Management Tool) WP7 deliverables.

2 – SUMMARY OF PREVIOUS DELIVERABLES

Evaluation Protocols (D7.1)

The D7.1 – Evaluation Protocols deliverable provided an elaborate description and recommendations of how the different aspects and components of SPICE project can be evaluated. This was the first time the complex organizational structures of SPICE were examined as a socio-technical system consisting of dynamic interactions occurring between people and technology within the entire system.
The social and cultural infrastructure(s) at SPICE consists of:

1. End-user communities
2. Communities of Interest (CoI)
3. Communities of practice (CoP)

Each of these communities were identified and categorized based on the actors involved in them, their types, and their relation to the relevant Case Studies. Metrics were also proposed to be used for evaluating these social and cultural infrastructure(s) (D7.1 – Evaluation Protocols, p.6 – p.33).
The technical infrastructure(s) at SPICE are the software and network systems aiding and enhancing the process for citizen curation by providing a technological foundation for the museums involved and they include:

1. User and Community Modeler
2. Semantic Analyzer
3. Social recommender system
4. Linked Data Hub
5. Ontology specifications
6. Value, thematic, and emotional reasoner
7. Scripting devices
8. Interfaces for interpretation, reflection, and scripting
9. Content materials in museums, created by end-users and members of the public.
10. Additional data gathered such as demographic, location-based, textual, and more.

There are several requirements from the Case Studies for each technical infrastructure that needs to be adhered to. Metric were also proposed to be used for evaluating these technical infrastructure(s) (D7.1 – Evaluation Protocols, p.6 – p.33).

A concise description of the requirements involving the processes and elements in the use of citizen curation methods were provided along with their considerations. These considerations included mechanisms for accessing, exploring, selecting, interpreting, reflecting, sharing, saving/archiving content. Along with these considerations, specific regulatory concerns related to cultural and physical accessibility as well as privacy-oriented concerns such as GDPR were examined in D7.1 – Evaluation Protocols. Finally, the chapter on the Case Studies delved into each Case Study based on their existing infrastructures, activity objectives, rules and discourses, and special considerations in relation to their context.

Socio-technical roadmap (D7.2 and D7.4)

Based on the view of complex organizational development through the interaction between people and technology, the socio-technical roadmap described the instantiation of the distributed co-design ecosystem in D7.2 – Socio-Technical Roadmap with Project Management Tool. A network visualization was provided illustrating the overall state of the project and the interconnected networks between the targeted communities (end-user, of practice, and of interest), case studies, work packages, and organizations and institutions. In addition to the distributed network, the overall pattern was gauged using activity models showing the different components such as actors/actants, tools, object of activity, activity outcome, rules, community, organization, and their structural relations under the weight of production, consumption, exchange, and distribution.

A literature review briefly examined the timeline of evolution in the discourse of socio-technical systems bearing a range of concerns. These are chiefly targeting the optimization of labor such as search for representations that afford an understanding of the technological and societal change to explorations regarding the situated nature of human knowledge and activities. This review also delved into the apertures in the late 20th century focusing on gender, race, and multicultural discourses. Based on these views, the socio-technical roadmap needed to accommodate the present social and environmental situation characterized by rampant disruptions that could easily lead to the erosion of complex organizational structures if not designed and retrofitted considering it. Therefore, the commitment of SPICE is towards co-design and inclusivity to broaden the scope to accommodate sustainable transitions that afford several constructive opportunities and innovative endeavors.

Timeline of Development (D7.2, D7.3, and D7.4)

The Case Studies' timeline of development elaborated on the proposed activities planned by each between January 2021 and April 2023 (end of the project). Each Case Study was provided with a questionnaire wherein they described their plans for every six (6) month period and the final (4) month period, i.e., Jan-June 2021, July-Dec 2021, Jan-June 2022, July-Dec 2022, and Jan-April 2023. The Case Studies have proposed several online (considering COVID-19) and physical co-design workshops with their end-user communities and mediators. The questionnaire also sought to understand the hindrances in development due to COVID-19, strategies proposed to adapt to the current situation (temporal, societal, environmental), and the influence of the SPICE toolkit on the objectives of their museum. WP7 has been tracking and monitoring these proposed activities and assistance will be provided to the Case Studies in case they are facing certain challenges.

Ultimately, to grapple with the complexities and create smooth communication as well as workflow, the PM Tool was created within SPICE SharePoint using Microsoft Planner. The objectives of the tool were to create project activities and enable task definition for the Case Studies and WPs. These provide a live view of development of all the SPICE systems, thereby making it easier to monitor, understand and carry out periodic analysis. Each Case Study and WP monitor their *board* containing *buckets* of activities and finer tasks. Several features in the tool allow task definition, delegation, setting deadlines, and descriptions/comments. Overall, the STS roadmap and the PM Tool play a crucial role in enabling the interaction and communication between the social and technical aspects that is inclusive of all actors in the system. They have been described further in D7.2 and D7.4.

The deliverables mentioned in this chapter, i.e., D7.1, D7.2, D7.3, and D7.4 are accessible here to members of the SPICE consortium as well as the heritage institutions.

Case Studies Roadmap (D7.3)

This deliverable described the co-design activities and workshops in the Case Studies during the first year as well as work carried out by WP7 targeting the Case Studies. There were significant delays and challenges posed due to the ongoing COVID-19 pandemic, however they were also countered through several new forms of collaboration and strategies, and these were proposed in D7.3 – Case Studies Progress and Plan. Finally, a timeline illustrating the roadmap for the Case Studies in relation to the scope of the SPICE project was outlined (see D7.3 – Case Studies Progress and Plan, p.31).

3 – REVISED ROADMAP

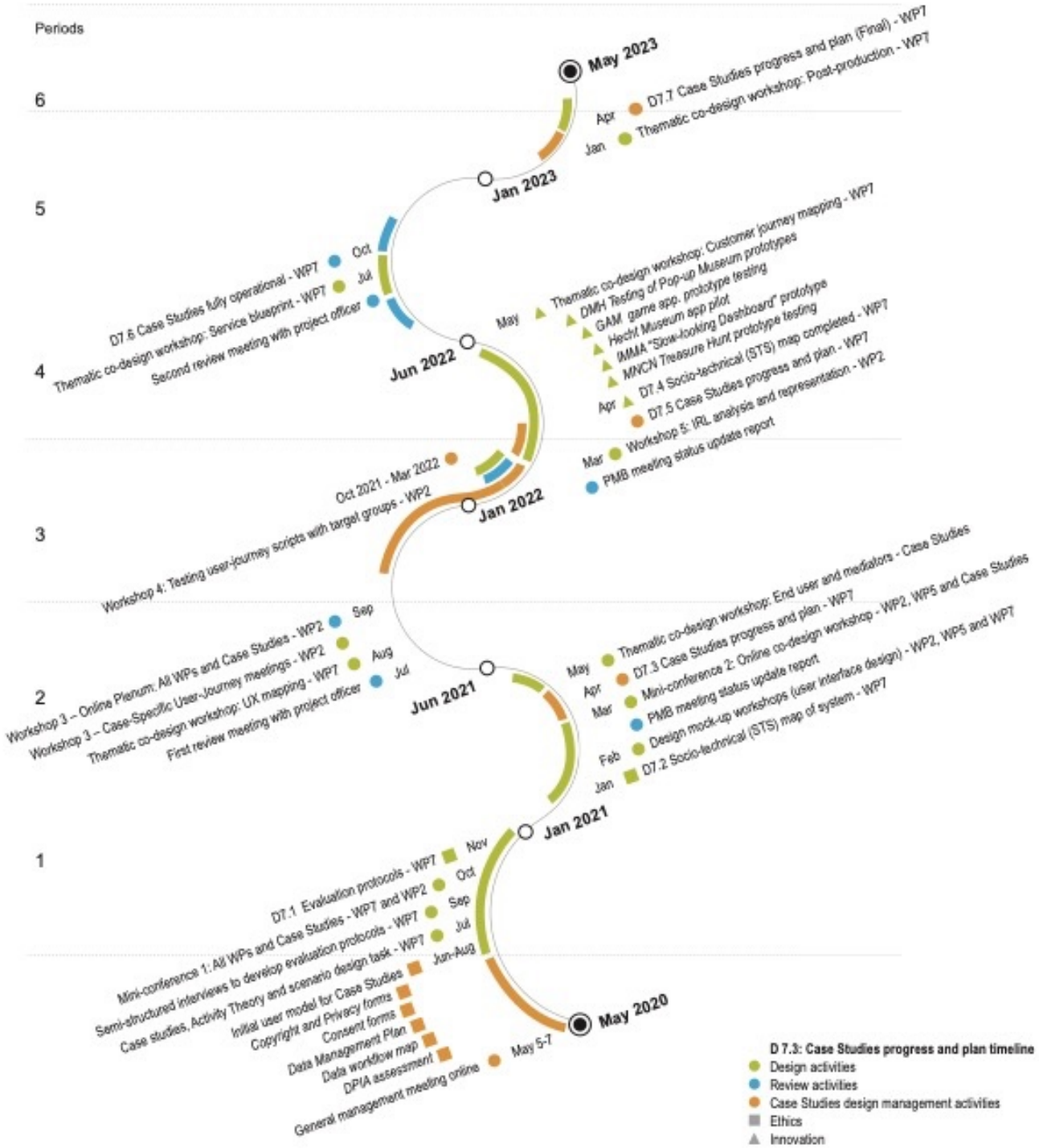

Fig. 1: The revised roadmap describing the Case Studies' progress and plan.

Case Studies Roadmap extended description

The mini-conference 1 conducted during Oct 2020 consisted of 4 workshops (W):

- W1: Citizen curation methods of the Interpretation and Reflection Loop.
- W2: Persona and user/community development.
- W3: Activities based on user-experience (UX) mapping.
- W4: User-interface (UI) design.

For a more detailed explanation of mini-conference 1 workshops, please refer to D7.3 – Case Studies Progress and Plan.

The mini-conference 2 conducted during March 2021 consisted of 4 workshops (W):

- W1: Developing case-specific interface mock-ups.
- W2: Visualizing citizen curation contributions.
- W3: Case considerations on the methods of the IRL.
- W4: Developing the socio-technical roadmap.

For a more detailed explanation, please refer to D7.3 – Case Studies Progress and Plan.

WP2's Workshop 3 conducted between August - September 2021 consisted of 4 meetings (M):

- M1: Establishing case-specific considerations, requirements, and needs.
- M2. Developing case-specific social cohesion dimensions, and activities for the user-journey.
- M3: Mapping the user-journey scripts.
- M4: Half-day plenum discussion between the Case Studies.

M1, M2, and M3 were bilateral meetings held by WP2 with each Case Study. M4 was an online plenum attended by the whole consortium. These are described in D2.3 - Revised Methods for Interpretation as well as in D2.4 – Revised Methods for Reflection.

During May and June 2021, the following Case Studies conducted thematic co-design workshops with their end-user communities and mediators:

- DMH: Workshops with institutionalized and free-going senior citizens.
- GAM: GAM game tested with focus groups.
- IMMA: Slow-looking activities with several communities.

These workshops and more are described in greater detail in this deliverable report's (D7.5) Chapter 5 - Pilot applications, workshops, and user testing in each case study.

During August 2021, UX mapping was conducted by WP7 via bilateral meetings with each Case Study. It is described in complete elaboration in this deliverable report's (D7.5) Chapter 4 - Persona design and user-experience mapping. Similarly, the customer journey maps, and the service blueprints scheduled for May 2022 and July 2022 respectively will also be co-designed via bilateral meetings between WP7 and the Case Studies. There will also be a need to carry on audits regarding the use of the STS map by the Case Studies.

In January 2023, co-design workshop will be organised by WP7 with the purpose of consolidating and branding Case Studies deliverables within their local as well as international contexts.

The initial roadmap for the Case Studies was presented earlier in D7.3 – Case Studies Progress and Plan (see p.31). The revised roadmap in Fig.2 was iterated mainly due to:

- Progress of the Case Studies and developments in the WPs, this has been in line with the previously proposed roadmap.

- New insights from the museums, SPICE tools, and technologies
- Certain minor challenges, hindrances, and cancellations of workshops and activities due to COVID-19.

However, as mentioned, much of the progress has been carried out as planned and the revised roadmap describes the progress and plan of workshops and activities in much greater detail.

4 – PERSONA DESIGN AND USER-EXPERIENCE MAPPING

To empower and broaden the scope of citizen curation, WP7 is focused on the application of design methodologies and its relation in achieving a deeper understanding of the stakeholders involved in the process of development of the infrastructures in SPICE. Earlier, laying a framework through Activity Theory (D7.2 – Socio-Technical Roadmap with Project Management Tool and D7.3 – Case Studies Progress and Plan), scenario design (D7.3 – Case Studies Progress and Plan) and Workshop 2 and 3 of Mini-conference 1 (D7.3 – Case Studies Progress and Plan) served as a pre-cursor to a detailed design of the Case Studies' persona profiles and UX maps. Persona design and UX mapping were carried out in Period 3 of the Case Studies Progress and Plan Roadmap (see Fig.2).

Persona design

Personas are archetypes commonly used as part of Human-Centered Design (HCD) methods and in situations in which it is deemed as beneficial to create fictional characters to represent different types of stakeholders who might use products such as the ones being developed in the SPICE case studies. Harley (2015) from the NNGroup defines a persona as a "fictional, yet realistic, description of a typical or target user of the product". Taking it further, Interaction Design Foundation (n.d) emphasize the need for research to design and develop personas and state that "(p)ersonas are fictional characters, which you create based upon your research to represent the different user types" [that might engage with your]" service, product, site, or brand in a similar way" and highlight some of the advantages of developing personas to:

1. Better understand "user's needs, experiences, behaviors, and goals",
2. recognize that "different people have different needs and expectations",
3. make "the design task at hand less complex",
4. guide the "ideation process" and
5. achieve "the goal of creating a good user experience for your target group".

The definitions and benefits mentioned in this report focus on our aim to provide a sound basis for HCD in our work. We also wanted to go even further and examine persona design from the point of view of SPICE goals of citizen curation. Therefore, we conducted a literature review going deeper into aspects of **accessibility, inclusivity, and co-design** in relation to the use of personas (Bobeth et al., 2012; Henke, 2019; Neate et. al, 2019; Sakaguchi-Tang et al., 2020).

Considering the aspects mentioned above, the Auckland Design Manual (n.d) provides a set of generic personas that can be taken into consideration for "universal design" of accessible and inclusive spaces. These personas described include: i) user with crutches, ii) adults with young children, iii) person with luggage, iv) people who are blind/ have low vision, v) ambulance officers, vi) wheelchair users, vii) pushchair user, viii) pregnant woman, ix) delivery person, x) older persons, xi) tourists, xii) person with hearing impairment. It is worth noting that some of these persona profiles align with needs of the end-user communities of the SPICE Case Studies while the others are particularly important to consider for the products being developed and museum spaces wherein workshops and activities are conducted.

Delving deeper into the topic of accessibility, Schulz and Fuglerud (2020) review the current state of research and use of personas and outlines a technique used to create personas with disability. The

authors state that the starting point for universal design is targeting "four groups of disabilities" that includes "vision, hearing, movement, and cognitive impairments" along with a persona for a senior citizen who usually has a "milder version of impairments from these groups". In this manner, the authors conclude that the personas capture the needs of people with disabilities and the attention of project designers. While this technique is useful, it might be counter-productive to reduce personas to be defined by a users' impairments, rather it would be more effective and perhaps unforeseen to include the impairments within the attributes of persona profiles to be conceived. In this regard, the creation of a persona for a senior citizen with mild impairments was more useful, especially because they are one of the end-user communities of DMH and IMMA.

Highlighting the fact of the increasing number in the older adult population in Europe, Nunes et al. (2010) described their role in the creation of a TV user interface for older adults with chronic conditions as a part of the eCAALYX project. Within the framework of a multi-disciplinary approach involving persona creation and user-research in a complex project, the authors reflected on the fact that personas are useful for keeping all the stakeholders in the same line of thought (Nunes et al., 2010). This is also very important for SPICE which has a complex network of stakeholders in the museums and researchers developing the social and technical systems.

To emphasize the need and value of participatory and co-design, Neate et. al (2019) examined the incorporation of co-created personas with diverse audiences and highlighted the benefits of using these co-created personas in the design process itself. In their study, the authors investigated i) people with Parkinson's disease, ii) people with dementia, and iii) people with aphasia and carried out co-design workshops with each group to co-create personas. During the workshop activities of co-creating personas, designers asked participants to fictionalize another person with similar impairments and list attributes that included name, age, background, hobbies, and more. The authors mention that the "(p)ersonas were constructed iteratively, always alternating between bringing out co-design participants' lived experiences through a workshop exercise, and then reflecting on and integrating this information into the personas" (p.5). They further mention that in the co-design workshops conducted with people with aphasia, the *SWIM technique* was applied wherein "(e)ach co-designer participant worked with a co-designer researcher in a one-on-one session in which they were asked about someone that they knew in real life, capturing specific details about that person's aphasia to be used in a persona". Neate et. al (2019) conclude that this type of engagement: "

- Broadened the demographic beyond a small team of co-designers to include people with diverse health needs;
- Fostered empathy, sympathy and memorability within the co-design process;
- Offered 'ramping' (bridging) into the design process of being a designer for non-designers; and
- Enabled ease of communication through a visual prop, and a way by which users might more effectively criticize designs by using the persona as proxy" (p.11)

The techniques discussed earlier seem promising, are highly relevant to SPICE, and have the potential of enhancing citizen curation. In addition to all these insights, further reading regarding persona design was provided to the members of the case studies and is accessible to the SPICE consortium here.

Based on the literature above, Table 4 outlines the common persona attributes across all the case studies and the reasoning behind their selection.

Persona attribute	Reasoning behind its selection
Name	This attribute is used to create a strong association and identity of the persona. The names are not intended to contain references of real users or participants and are fictionalized purely for the purposes of establishing a persona profile.
Age group	A key component of the descriptive demographics to estimate users' perceived interaction with artworks, design, and technology.
Gender identity	This is an optional attribute for case studies to fill in. Creating several personas with varied gender identity promotes inclusivity in design.
Background	Understanding the background helps in charting out profession, occupation, expertise, and past experiences of a persona profile.
Interests	These interests include hobbies, activities, preferences to certain types of museum artefacts, and more.
Values	Includes approaches, outlook, philosophy, and desires. For example, environmentalism is considered a value.
End-user communities	End-users are people (e.g., individuals, actors) who ultimately use or intend to use a product or service being developed and in SPICE, these individuals are studied from the perspective of the communities they belong to.[2] For a thorough categorization of end-user communities, please refer to D7.1 – Evaluation Methods Protocols (pp.9 – 12).
Communities of interest (CoI) and Communities of Practice (CoP)	Communities of Interest (CoI) are groups or communities of people who share a common interest and 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. For a thorough categorization of end-user communities, please refer to D7.1 – Evaluation Methods Protocols (pp. 14 – 19). One of the key purposes of understanding these communities is to ascertain with whom the museum communicates for advertising and marketing the Case Study.
Accessibility needs	This is paramount and a huge component of promoting inclusivity, ethical design, and designing for a broader target audience.
Insights and recommendations	Based on the common and case specific attributes, insights can be derived, and key recommendations are taken into consideration to ensure that workshops, activities, and software applications developed are tailored towards promoting citizen curation.

Table 4: Persona attributes and the reasoning behind their selection.

There are other attributes of a persona profile that may be specific only to a case study and irrelevant to others. In this regard, each case study developed persona attributes considered essential to their design and they are listed in Table 5 below.

Case Study	Case specific attribute	Reasoning behind the selection

[2] Please note that there are similarities and differences between the end-user communities, communities of interest (CoI), and communities of practice (CoP) being developed in WP7 in comparison to the explicit and implicit communities developed in WP3. To gain a thorough understanding of the communities described in WP7, please visit D7.1 – Evaluation Methods Protocols and similarly see D3.3 – Final User and Community Modeler to understand the communities described in WP3.

DMH	Experience with digital devices	The Pop-up VR Museum is a 360 immersive media application designed and developed in the DMH case study. It is slated to run on portable VR Headsets as well as browser-based platforms. Therefore, it is essential to create several persona profiles estimating different users' experiences and initial encounters with different types of media and technology.
	Experience with immersive media devices such as virtual reality (VR) and augmented reality (AR)	
	Language literacy (Fin, Swe, Eng, Finnish sign language)	In Finland, the official languages and the most spoken ones are Finnish and Swedish. English is also widely used in Finland. The Pop-up VR Museum contains stories in audio and text format contributed by end-user community members, and they will be subtitled based on a user's language preference.
	Interest in design	Based on a user's level of interest and engagement with design and cultural heritage, the Pop-up VR Museum will be designed to provide content geared towards these attributes.
	Interest in cultural heritage and museums	
	Interest in socializing	Most VR applications are often experienced alone wherein an individual is in a virtual environment, in certain cases this may seem isolating. Therefore, some of the participants would prefer more social experiences wherein they can engage with others while in VR. On the contrary, this could also lead to anxiety and embarrassment for individuals who would prefer being alone in the virtual environment not having to engage or reveal their own actions to them. Therefore, this requires a balancing act in designing the Pop-up VR Museum. On another note, socializing is a mechanism for advertising and garnering visibility for the Pop-up VR Museum and therefore a key attribute to a persona profile of DMH.
GAM	Experience with digital devices	The GAMgame is sought to be a browser-based application running on different digital devices.
HECHT	Belief systems (religion)	Opinions towards historical events derived in the HECHT Case Study may vary based on a participant's beliefs and religious outlook. These are studied carefully.
	Interest in history and museums	Based on a user's level of interest and engagement with history of ancient Israel, the Hecht Case Study will be designed to provide content geared towards this attribute.
IMMA	Experience with digital devices	Some of the IMMA web applications may require a user's minimal experience with digital devices.
	Interest in modern and contemporary art	Slow looking activities and IMMA Viewpoints may depend on a user's interest in modern and contemporary art.
MNCN	Experience with digital devices	The Treasure Hunt is a digital application with components of AR running on smart phones and

		tablets and may depend on a user's past experiences with these types of devices.
	Reading fluency	Since the Treasure Hunt is being developed for children of varying age groups who may not yet be very fluent in reading or grappling specific terminologies, the textual content within it would benefit from simplification that fosters inclusivity.
	Interest in nature	Relevant to the Treasure Hunt app focused on topics such as species of dinosaurs, their fossils, climate change, and more.

Table 5: Case specific persona attributes and the reasoning behind their selection.

Overall, the persona profiles have been designed and act as a key component in the development of UX maps to assess and validate:

1. The user experience
2. Accessibility needs
3. Inclusivity
4. Participatory and co-design
5. An ethical framework for design

Please note that these persona profiles are not set in stone and subject to several rounds of iteration based on user-testing conducted in each case study.

During Period 3 of the Case Studies roadmap (see Fig.2), diverse persona profiles were conceived and envisioned in each Case Study out of which the Case Studies were tasked to come up with UX maps for three (3) of these profiles. Some of the persona profiles in each Case Study are outlined in the following tables: Table 6 – Table 10.

DMH:

Name	Maija	Adam	Outi
Age group	70-80	20-30	30-40
Gender identity (optional)	Female	Male	Prefers not to identify
Background	Retired art teacher	Polytechnic university student looking for work if residence permit approved	High school graduate currently working part-time at the village's only R-Kioski looking for more steady work)
Interests	Painting, music, weaving, socializing with friends	Writing, cooking, guitar, football	Weightlifting, football, beer-brewing, sailing, off-road biking
Values	Acceptance, open-mindedness, family	Striving to make best use of freedom and opportunities, family	Independence
End-user communities	Senior citizen institutionalized	Asylum seeker - Potential future citizens	Rural dwellers
Communities of Interest (COI) and Communities of Practice (COP)	Bingo club at the care home, senior care center service community activities such as theatre visit	Band, ARBIS language learning class	Skiing and snowboarding club, tour biking

Accessibility needs	Preferably seated experience of VR and requires assistance from a mediator	Would prefer to have the headset at the immigration center due to high interest in VR and use for long periods of time.	Access to local library with VR available there.
Experience with digital devices	Frequently engages with the interactive "OiOi digital wall" at the care home. Rarely uses the computer: mostly to check bank statements	Spends significant amount of time on his phone speaking to family members and friends back home, watching videos, and occasionally playing games.	Frequent use of her phone, tablet and laptop for shopping, entertainment, and some research.
Experience with immersive media	Tried it only once at the care home and enjoyed painting in the virtual environment.	Used VR a couple of times in Helsinki in HAM and another exhibition and it drew interest in experiencing more.	Hasn't attempted it before but heard that it is cool and would love to experience it.
Language literacy (Finnish, Swedish, English, Finnish sign language)	Finnish	English	Finnish and Swedish (moderate)
Interest in design	Fairly interested	Somewhat interested	Low interest
Interest in cultural heritage and museums	Very enthusiastic	Not particularly knowledgeable, but open to know more and some of the objects remind him of similar ones back home	Not very interested, but slightly open to having her mind changed
Interest in socializing	Moderately interested in socializing, especially with friends at Kustaankartano; doesn't mind social experiences in VR	Interested in socializing and meeting many new people in physical locations and VR	Introverted and prefers to be alone
Insights and/or recommendations	Carried out a session of artefact analysis with DMH Design Objects and provoked plenty of stories and memories that she enjoyed.	Would love to use VR as a tool to tell his own story of swimming across the Mediterranean because he is currently writing a book about it.	Opportunity to draw her in to VR and demonstrate something new that has the potential to provoke and guide her interest towards cultural heritage.

Table 6: Examples of persona profiles in DMH.

GAM:

Name	Ambra	Ahmed	Giorgia
Age group	16-19	16-19	35-40
Gender identity (optional)	Female	Male	Female
Background	High school student	High school student	Museum director
Interests	Reading, pop culture, arts, and culture	Sports, pop music, fashion	Art and culture, movie-lover, role playing games

Values	Environmentalism	Cooperation and environmentalism	Open-mindedness, accessibility advocate
End-user communities	Students	Students	Educators
Communities of interest (COI) and Communities of Practice (COP)	Social media groups following specific artists	Social media groups	-
Accessibility needs	Sign language	-	-
Experience with digital devices	Very fluent with computers, tablets, phones, and more	Very savvy with the latest tech	Somewhat familiar with different types of applications on tablets and phones
Insights and/or recommendations	Ensuring that the GAMgame works well with (Italian) sign language	-	-

Table 7: Examples of persona profiles in GAM.

HECHT:

Name	Anna	Tal	Yara
Age group	16	41	17
Gender identity (optional)	Female	Male	Female
Background	Student at a religious local school (girls' school)	Teacher	Student at a Christian school
Interests	Reading, sports	History, documentaries	Music, art
Values	Patriotism	Pluralism, open-mindedness	-
End-user communities	Student	Educator	Student
Communities of Interest (COI) and Communities of Practice (COP)	Social media groups on specific topics within the religious school	Social media groups	Social media groups of musicians and artists
Accessibility needs	None	None	None
Belief systems (Religion)	Religious	Secular	Religious
Interest in history and museums	Interested in Jewish history but does not really like museums.	Very interested in history	School activities and specifically grades are important, but not really interested in history.
Insights and recommendations	How can we make her engage and like the museum activities?	How can we support schoolteachers and enable them to run the activities?	-

Table 8: Examples of persona profiles in HECHT.

IMMA:

Name	Cath	Mohammed	Aoife
Age group	35-44	35-44	15-24
Gender identity (optional)	-	-	-
Background	Teacher and a visitor engagement facilitator	Asylum Seeker living in Direct Provision	Secondary school student and aspiring artist
Interests	Communication, guiding, education, art of Lucian Freud	Syrian food, history, culture	Painting, poetry, reading, Dua Lipa stan
Values	Liberal, believes passionately in the arts	Open-mindedness, interest in other cultures, and national pride	Environmentalism
End-user communities	Facilitator	New Communities Partnership (Asylum seekers)	HELIUM Arts (Students and learning groups with special needs)
Communities of Interest (COI) and Communities of Practice (COP)	United Arts Club	-	Social media (Instagram, TikTok)
Accessibility needs	-	Lacks confidence in speaking and writing in English; will require additional support during any workshop	Online: flashing images removed from web applications; autoplay functions on video content must be disabled On-site: potentially triggering imagery/flashing lights must be avoided or switched off; staff fully trained to deal with seizures.
Experience with digital devices (smart phones and iPads)	Very experienced; plays games on her phone and uses the iPad in classroom.	Has a phone but does not use social media; lacks confidence typing in English	Digitally literate and fluent at self-expression via digital devices
Interest in modern and contemporary art	Very interested and engaged in modern and contemporary art	Likes traditional and ancient artforms, e.g., some Old Masters paintings and public sculptures; does not like much modern and contemporary art	Interested in contemporary art; does not regularly visit art galleries or museums due to illness
Insights and recommendations	Interested in how the application could be used with groups; could it be used with an interactive white board for example?	Sometimes struggles with English so a version of the application in simple English (like simple English Wikipedia) would be helpful; or incorporation of automatic translation.	Interested in seamless integration with social media apps like Instagram.

Table 9: Examples of persona profiles in IMMA.

MNCN:

Name	Maria	Marco	Pablo
Age group	8-11	26-35	8-11
Gender identity (optional)	Female	Male	Male
Background	3rd to 6th grade student	School teacher	A child who often visits the museum with his mother
Interests	YouTube streaming, drawing, and sketching	Hiking, science, sports, new ways of teaching, educating	Video games, YouTube streaming, football
Values	Popularity, attention, competition	Environmentalism, using technology for education	Having fun (adrenaline rush)
End-user communities	Primary school student	School teacher	Primary school student
Communities of Interest (COI) and Communities of Practice (COP)	Teachers' union, hiking club, small friendly groups	Teachers' union, hiking club	Football with friends, YouTube follower of some channels about video games
Accessibility needs	-	-	-
Experience with digital devices	Frequent use of smart phones, uses desktop at home following YouTube channels, using tablet for drawing.	Uses laptop with educational purposes, read scientific magazines, and watch sports.	Frequent use of gaming consoles, mobile devices.
Reading fluency	Can read slowly but correctly	Reading skills extremely fluent	Can read slowly with some mistakes
Interest in nature	Enjoys nature and adores animals	Interested in scientific topics about nature	Enjoys playing outside and being around small animals.
Insights and/or recommendations	Likely to enjoy the visit, the use of the tablet and participate in a competition to win a prize.	Likely to enjoy accompanying kids on their visit and will be triggered to make a new treasure hunt based on his own interests.	Prone to skip some of the instructions, however, would be interested in finishing the goals of the game and seeing the results.

Table 10: Examples of persona profiles in MNCN.

Here are other key insights and recommendations from persona design across all the Case Studies:

1. Experiences designed should attempt to prompt meaningful and engaging social interactions amongst audiences who would prefer it.
2. Using VR, AR, gamification, and other new media would enhance experiencing as well as narrating stories.
3. Educators need to be supported in the process of co-designing workshops and activities.

4. Simplification of languages would enhance inclusivity and support users who may have reading impairments.
5. Tools for authoring and designing group activities is key for the SPICE project.

Designing personas turned out to be a very useful exercise in understanding the diversity within the target audiences and other stakeholders of the case study museums as well as emphasizing accessibility, inclusivity, and co-design ethos for citizen curation in SPICE.

User-experience mapping

User-experience (UX) was previously defined within the context of SPICE as in D7.1 – Evaluation Methods Protocols as "an end-user's interaction with front-end tools in order to foster engagement and reflection" (p.33). Due to considerations for social cohesion, participation and inclusion, a meaningful UX would also consider fulfilling engagement and fostering equality (see D7.1 – Evaluation Methods Protocols, p.33). One of the main reasons for designing a diverse set of persona profiles was to understand different users' experience of a Case Study's workshops, activities, and final pilot pieces. To put it simply, a UX map is a method of estimating and visualizing what an average user will go through from the beginning to the end of using a product or service. Gibbons (2017) from the Nielson Norman group (NN/g) uses the term "experience map" and defines it as a "visualization of an entire end-to-end experience that a "generic" person goes through in order to accomplish a goal".

Quite often in broader design literature, the terms "user-experience map", "experience map", "user-journey map", "journey map", and "customer journey map" are often conflated and used interchangeably. Therefore, we decided to carry out a literature review to delineate between these terms, understand the use cases, and examine the parameters that are used and could be applied to the UX maps of the Case Studies. The Interaction Design Foundation (n.d) asserts that "(c)ustomer journey maps are used to map the relationship between a customer and an organization over time and across all channels on which they interact with the business" and "(d)esign teams use customer journey maps to see how customer experiences meet customers' expectations and find areas where they need to improve designs". Following Gibbons (2017) from NN/g's previous definition of experience mapping, she also provides an overview of four commonly used mappings, namely: i) empathy mapping, ii) customer journey mapping, iii) experience mapping, and iv) service blueprinting, wherein a customer journey map focuses "on a specific customer's interaction with a product or service". She (2017) also explicitly states that an experience map should be used "before a customer journey map in order to gain understanding for a general human behavior". At this point of the project in SPICE, we are considering a broader segment of users based on inclusivity and measuring experiences irrespective of whether a particular user is a customer or not; in addition, customer journey mapping is scheduled for May 2022 as a part of the Case Studies Progress and Plan roadmap outlined in D7.3 as well as the previous chapter.

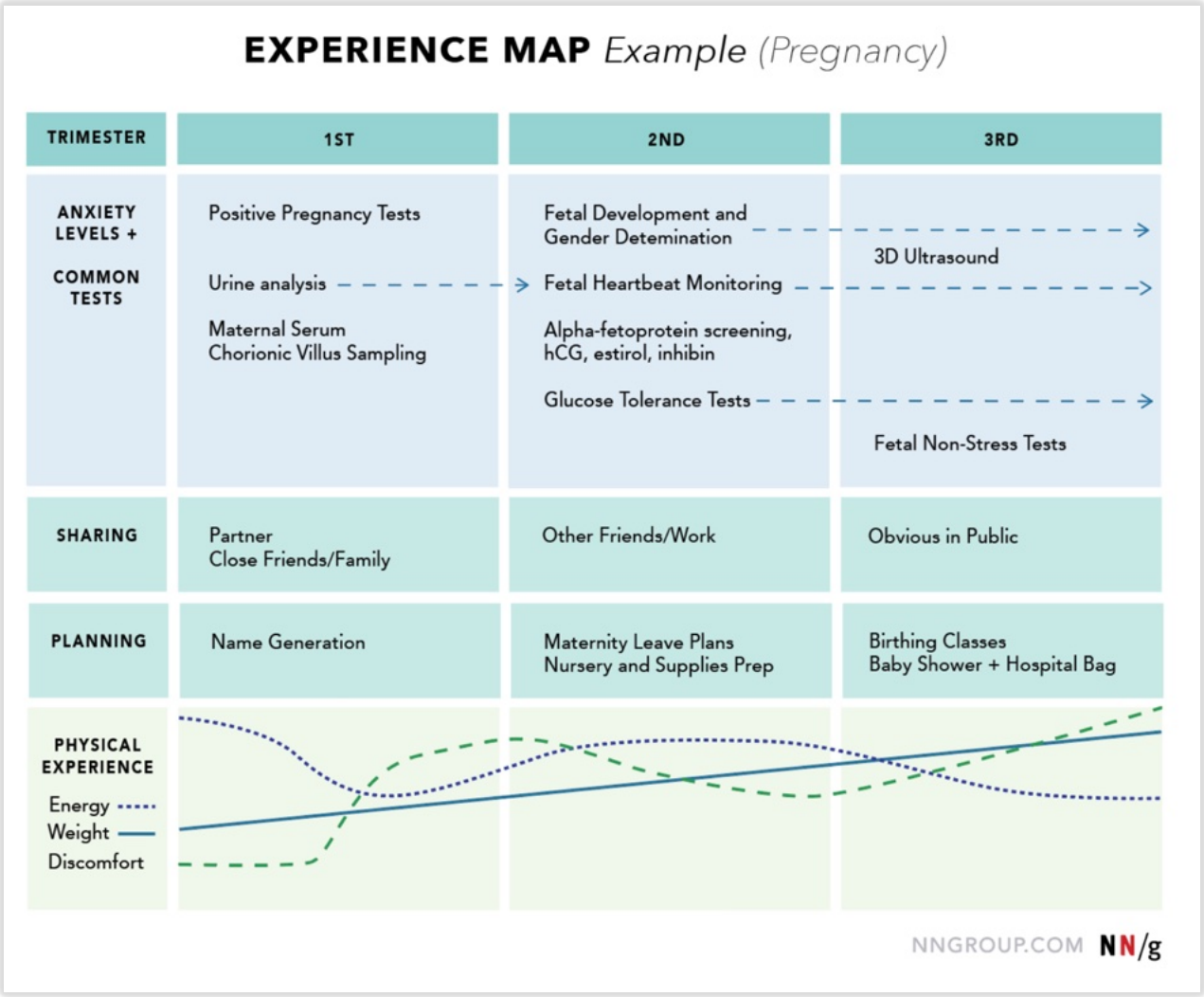

Fig. 3: An example of a UX map created by NNGroup elaborating on different stages of pregnancy (Gibbons, 2017).

In the (Fig.3), the parameters defined for the UX map include: i) trimester, ii) anxiety levels + common tests, iii) sharing, iv) planning, and v) physical experience. These parameters are relevant to the context of someone going through pregnancy and other contexts are bound to have different ones. Some of the useful parameters for citizens using a Case Study museum's service could include *actions* described in the earlier map such as planning and sharing as well as *emotions* such as anxiety. We began assessing this map as a basis and carried out a brief literature review of other contexts that may be of a bit more relevance to SPICE.

In another example of the Rail Europe Experience map (2011), the horizontal dimension is composed of a user's phases while the vertical is mapped as action, thinking, feeling, and experience. Similarly, the Visual Paradigm's (n.d) horizontal dimension is defined by touchpoints while the vertical includes thinking and feeling clubbed together as a single parameter, and recommendations referring to ideas for improvement. The recommendation is an essential parameter for an iterative design process and would be important to SPICE. Further selection of literature is available to the Case Study members and the SPICE consortium here.

Based on the selected literature and the context of the SPICE project, we decided to develop a template of a UX map with selected parameters applicable to the Case Studies for which the reasoning is described in Table 11 below.

Parameter	Reasoning
Touchpoint	The different phases constituting interaction points of a SPICE pilot application or workshop that a user is going through, this is the horizontal dimension of a UX map.
Action	Decision or selection made by a user at the touchpoint.
Emotion	Thinking and feeling of a user at the touchpoint.
Breakdown	Potential disruptions, unintended events, challenges that could occur at the touchpoint.
Recommendations	Alternative approaches that could mitigate a breakdown and/or broader consideration at the touchpoint accommodating the framework of accessibility, inclusivity, co-design, and ethics.

Table 11: Parameters for SPICE UX maps and the reasoning behind their selection.

It is important to note that WP2 is co-designing "user-journey scripts" (D2.3 - Revised Methods for Interpretation) with the Case Studies which is quite different from the UX maps being co-designed here at WP7. However, there are similarities as well and they include phases/touchpoints in a user journey. A key distinction between the two is WP2's closer examination of the interpretation-reflection loop and technical specifications in workshops and activities carried out to test user-journey scripts while the emphasis on the UX maps is design methodologies such as participatory and co-design as well as assessing human behavior, emotions, and strengthening the UX while accommodating a diverse set of user needs and recommendations based on personas.

Following the co-design ethos, we conducted one-on-one sessions with the Case Studies to brainstorm and design their respective UX maps based on their persona profiles. The UX map was created based on the template and parameters described earlier. These sessions were carried out via multimedia conferencing using Zoom for videoconferencing and Mural as an online collaborative brainstorming tool. To explore the process of ideation and co-creation extensively, the link to the recordings of all the sessions is available to the SPICE consortium here.

It is essential to note that these UX maps are not set in stone. In fact, they need to be iterated and redesigned based on tests conducted in each Case Study. Among 3 UX maps developed for each Case Study, an example of a selected UX map from each one is described below through a prominent persona's touchpoints, actions, emotions, breakdowns, and recommendations.

DMH:
Among the three (3) UX maps co-designed by DMH along with WP7, Table 12 represents a UX map of a prominent persona profile of Maija (Fig.4) who is part of a key demographic, i.e., an institutionalized senior citizen end-user community.

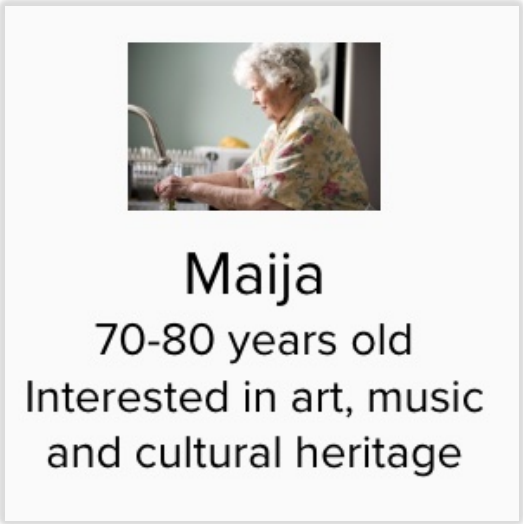

Fig. 4: Selected DMH persona profile for the design of its UX map.

Touchpoint	Action	Emotion	Breakdown	Recommendation
In her room at the care home, the day before the visit.	Lying on the bed about to sleep.	Heard that you can paint in VR and excited about it.	Nervous about putting a gadget on and looking awkward.	Promoting the pop-up museum using visuals as early as possible so that people are comfortable.
Arriving at the exhibition area, assisted by her nurse and the mediator.	Walking slowly towards the placed VR headset in the room.	Many people chatting around making her nervous.	Would prefer to come at a different time when no one is around.	Consider positioning of the VR headset. Should it be in the main area connected to a screen so others can see what a user is experiencing? Or in a more secluded private area in the exhibition space? Or should the headset be offered to her in her room?
Putting on the portable headset and tracking gloves.	Help provided to her to adjust everything clearly.	Feeling awkward constantly directing the mediator to adjust, but slowly in awe at the virtual world.	Hard to adjust VR to needs of viewers, especially a senior citizen.	Pre-adjusted configurations to the headsets that fit most senior citizens.
Pop-up VR Museum virtual experience begins.	Presented with 3 virtual artefacts	Not sure whether or how to grab the	Language in the virtual	Video tutorials presented beforehand.

	but doesn't grab them.	virtual artefacts and asks for help.	environment not clear.	
Asked to pick up one of the virtual artefacts that is mapped to a real object.	Moves her left hand to pick it up, it starts glowing & she hears voices.	Very excited to touch the object and see it glowing.	Unable to hear the voice clearly.	Voices need to be kept short and looping after a pause.
The artefact tells her to place it next to another one to continue the story.	Puts the artefact back on the table.	Despite not understanding the voice, curious about the artefacts and tries different ones.	"Puzzle" of solving and continuing the story/game not understood.	Despite users not figuring out the "gameplay" the experience should be open and "playful".
Visiting family at Kustaankartano (a senior care center in Helsinki) over dinner.	Talking to her grandchildren about school.	Unable to contain the excitement telling everyone about VR, but patiently waits and listens to their stories.		Methods to share the pop-up museum, could be as trivial as badges, postcards.

Table 12: DMH UX map codesigned using the persona profile of Maija.

GAM:
Below, the UX map in Table 13 highlights a typical use case of the GAMgame through the lens of a persona who is 35-40 years old and interested in modern art.

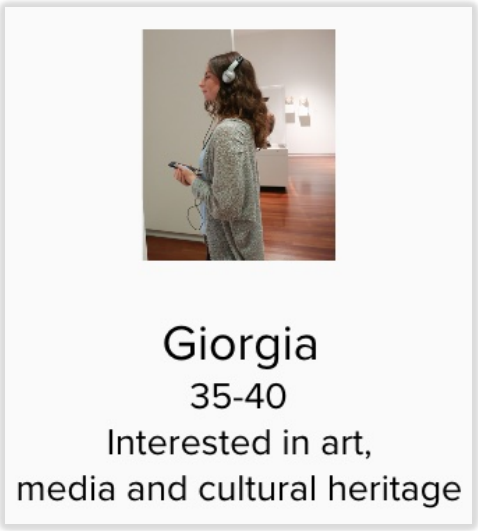

Fig. 5: Selected GAM persona profile for the design of its UX map.

Touchpoint	Action	Emotion	Breakdown	Recommendation
Inside GAM, school: QR code and advertisements.	Reads the flyer and tries to scan QR code.	Eagerness and willingness to participate and eagerness	-	
Reads more about it online: GAM	Reading more in detail.	Mixed feelings of attraction and curiosity	-	

website, blogposts.				
Receives the link	Downloads the application on her phone.	Slightly anxious	Slow launch could lead to quitting it.	
Application launch	Launches the application.	Relief	-	
Welcoming, guidance and tutorial, see the features.	Reads everything	Inclusive and feeling welcomed	-	Keeping tutorials light and self-explanatory and self-apparent, sign language.
Browsing the artworks (considering filtering categories).	Selecting 3-5 artworks	Lost in selection, difficulties in exploration, empowerment from finding the right tools.	Too many artworks	How to have filters: historical, dimensions, emotions of other users. Limiting the set of artworks in the categories.
Creating the story based on artworks.	Using a mix of emojis.	Joy of creation, enthusiasm, absorbed, flow.	Unclear design causing confusion about what to do.	Consider the screen size (small) for inputting stories, how to have the space and order for text. Making use of sensemaking tools.
Recommendation phase	Receiving suggestions about other people's stories.	Curiosity to read others.	-	An idea for design is to see others' stories as a reflection and a skip option. Refining the recommendation to maintain originality.
Submission and sharing within the app.	About to submit and thinks a lot about sharing and wants to save "the investment".	Cherishing and appreciating their input.	-	Competition for selection of "10 best stories"
Telling colleagues and "real world".	-	Excitement	-	-

Table 13: GAM UX map codesigned using the persona profile of Giorgia.

HECHT:

In HECHT, the UX map created demonstrates the user case of a persona profile (Fig. 6) who is a part of a minority demographic and within the age group of the targeted audience.

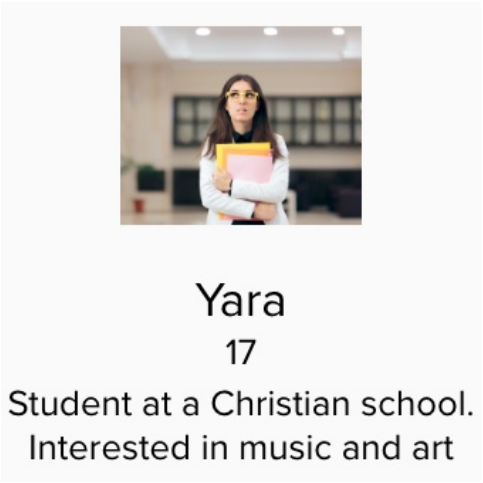

Fig. 6: Selected HECHT persona profile for the design of its UX map.

Touchpoint	Action	Emotion	Breakdown	Recommendation
Classroom: Presented a video about the rebellion and was asked for opinions.	Because of no real interest in history, not so sure what to answer.	Thinking for a long time.	What kind of inclination or bias would the video presented have?	
Presented with another opinion that is contrary to her own opinion.	Reading the other opinion carefully.	Feeling empathy toward the other.	Student may not accept or like other opinion and may be too negative about it.	Guidance should be given to respect other's opinions and to address them.
Visiting the exhibition and asked to take photos of artefacts supporting their opinion.	Going around the exhibition and taking photos.	The exhibits may trigger curiosity, interest, or other emotions.	Some of the artefacts seem entirely unrelated.	Guide students that show no interest in exhibits.
Teacher presents different photos taken.	Students examine other students' examples and react to them.	Shy, timid	Yara may be reluctant to participate.	The teacher should facilitate the activity to have all students participate
Museum personnel provide a tour of the exhibition.	Students walk around the museum with the guidance of the museum personnel.	Interest	Group may be large and thus some students may get lost.	Small groups, relatively short explanations
Asked to provide opinions on how the design of the exhibition affects the rebellion question.	Teachers engage students in a discussion on the design of the exhibition.	Shy, timid	Students may not have a strong opinion.	Small groups, teachers should encourage students and facilitate discussion.

Designing their own virtual exhibition.	Students will use digital tools to design a digital exhibition.	Creativity overflowing	Students may think their design in not "good enough".	Provide clear instructions that there is no correct answer. enable time and room for creativity.

Table 14: HECHT UX map codesigned using the persona profile of Yara.

IMMA:
Here, we showcase a UX map from IMMA from the point of view of a persona who may have certain difficulties undertaking the slow-looking activity due to Attention-Deficit/Hyperactivity Disorder (ADHD) and this could be accommodated as well as resolved.

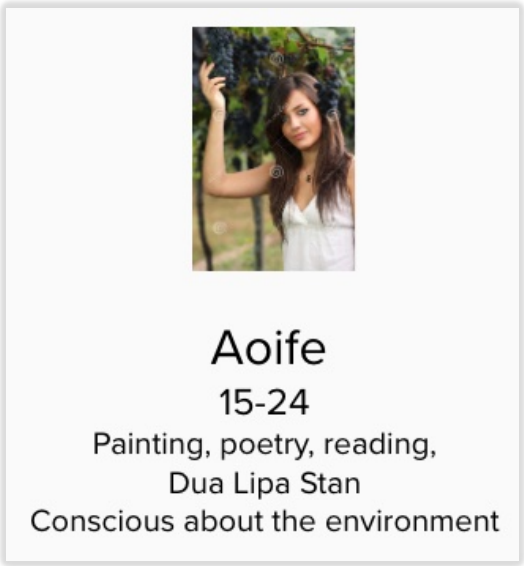

Fig. 7: Selected IMMA persona profile for the design of its UX map.

Touchpoint	Action	Emotion	Breakdown	Recommendation
Community organization circulating info about slow-looking via mailing list and internally with hospital.	Accepts the invitation and wants to let her friends know.	Curious about the event and wants to participate despite being shy.	Age groups and how the info is circulated, social media, institutional vs mailing lists.	Steering committee would circulate info as volunteers, expect the organization to good line of communication.
Arrival at the space guided by mediators.	Looking around at the space curiously.		-	-
Session 1 warm up activity to define terms.	Defining "citizen curation".	Bored a little	Losing interest	How to make it more fun and entertaining, look at artwork and carry out

				short snappy slow-looking activity more mediated?
Exploring the gallery space.	Particularly interested in an artwork that reminds her of her childhood.	Intrigued by some of the artworks	-	Tasks: Can you find 5 artworks? Orientation
Undertaking the slow-looking activity.	Selection of family theme and writing about the theme.	Impatient	ADHD, racing to finish the activity	Relation between technology and slow looking. Environmental setup such as ambiance? Influence of mediators. Design of the space.
Group reflection	Sitting there quietly while others are discussing and expressing their views.	Shy	Wants to talk, but feels a bit intimidated	Effective mediation, gesturing, breaking groups up.
Break before the next session	Reflection time with painting, drawing and creation inspired by a certain response.	Feels that her drawing isn't "good enough" to show.	Not wanting to draw, better at dancing.	Individualized sessions: create dance, collage. Anonymized drawings and paintings.

Table 15: IMMA UX map codesigned using the persona profile of Aoife.

MNCN:
A typical user for MNCN's Treasure Hunt application is a student within the age range of 8-13 who is likely to enjoy video games and is interested in prehistoric creatures.

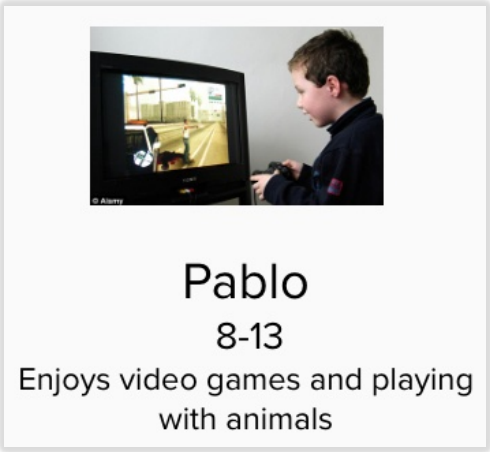

Fig. 8: Selected MNCN persona profile for the design of its UX map.

Touchpoint	Action	Emotion	Breakdown	Recommendation
First contact: Teacher explains about the field visit to class students.	Pablo in class playing with his friends.	Excited about the visit, especially when he hears "games" and "animals". Angry about extinction with older generation.	Misaligned expectations and sad to hear about animal extinction.	How much to communicate and how much to leave room for curiosity.
Arrival at the space.	Teacher explains about the museum, topic, and the system.	Can't wait to pay	Too many explanations leading to confusion.	Mediation by experienced teachers and guides.
The beginning	Simple story line with character provided and told to act.	Feeling like his individual actions could make a change.	-	Using actual people from the museum personnel such as cartoons could make educators feel that this game is part of their own content.
Play time 1: Bee-eater	Application turns into an AR interface.	Excitement with the switch to AR which interacts with the real exhibit.	Doesn't figure out that it is AR.	Mediators there to help. Perhaps also rethinking the use of the word "hunt" in the English version of the game.
Play time 2: Pelican	Putting together scattered pieces which are in front of the actual skeleton.	-	Puzzle being difficult and kid getting impatient.	Contextualized the mini game contents with the actual exhibit.

Opinions	Needs to provide his opinion about climate change.	-	Answering too fast	Delays, negative points, textual input, 5-6 letter word guesses. Groups of images to select and be more attached to and get an equivalent of.
Homework	Writing an essay	Feeling pressurized by the contest.	Too competitive	Contests should be made more inclusive. More incentive for participation, museum makes a show.

Table 16: MNCN UX map codesigned using the persona profile of Pablo.

Along with WP7, the Case Study members have designed a series of personas and UX maps and hence have a clearer visualization of what could take place during a typical session of pilot testing or a workshop activity. At this point, one can already estimate a typical user's background, interests, and values as well as potential set of actions, emotions, and breakdowns. Therefore, through this process of co-design a set of recommendations for design can be derived even before testing. It is also worth revisiting and iterating the persona profiles and UX maps after several rounds of testing to assess other breakdowns and obtain a more comprehensive visualization of a session. This would also serve as a strong basis for co-designing customer journey maps and a service blueprint for a Case Study.

5 – PILOT APPLICATIONS, WORKSHOPS, AND USER TESTING IN EACH CASE STUDY

DMH

The Pop-up VR Museum is a Virtual Reality (VR) application in which its users can access, interact, and engage with the collection of the Design Museum Helsinki. The target audience of the pilot include three (3) different end-user communities, namely senior citizens, rural communities, and asylum seekers. In this process, the mediators play an important role in aiding the application's development and guiding its users; these mediators are often comprised of curators, researchers, and members of institutions such as senior care centers. To learn more about the DMH Case Study and its application of interpretation and reflection methods, please visit D2.3 – Revised Methods for Interpretation, Section 2.0 – Case-specific applications of the Interpretation and Reflection methods.

Some prominent features of the Pop-up VR Museum for its end-users include:

1. Interacting with DMH artefacts such as picking it up, rotating, tactile interactions, naming and tagging artefacts (see "Artefact analysis as an interpretation method" in D2.1 – Initial Methods for Interpretation).
2. Selecting and listening to stories of other contributors emanating from the artefacts (see "Narrative methods as interpretation methods" in D2.1 – Initial Methods for Interpretation).
3. Experiencing an immersive virtual environment via autoethnography and duoethnography (see "Duoethnography as a reflection method" in D2.2 – Initial Methods for Reflection)
4. Progressing within the experience through gameplay that involves solving quests/puzzles, reflecting on these stories with own contributions such as drawing, painting, narration, and comments.

Features in the Pop-up VR Museum pipeline for museum curators and mediators and user communities include:

1. Curating several contributions via selection and editing (see "Visualization techniques as an interpretation method" in D2.1 – Initial Methods for Interpretation)
2. Adding new or missing artefacts to the catalogue of the Pop-up VR Museum (see "Collecting as an interpretation method" in D2.1 – Initial Methods for Interpretation)

Through this dynamic process DMH aims towards inclusivity, enhancing participation in citizen curation via DMH collection, and closing the gap between museums and technology.

The Pop-up VR Museum works with portable VR headsets as well as via browser-based interactive 360 platforms. As mentioned earlier, a user/player typically engages with the Pop-up VR Museum to interact with DMH artefacts, manipulate them in a virtual space, listen to stories from other end-user community member, and contribute their own. For this, DMH has developed a storyboard

structure shown in Fig.9 – Fig.12 that demonstrates Pop-up VR Museum's key features, choices offered to a user/player, and a base-level interaction with the SPICE technical infrastructures.

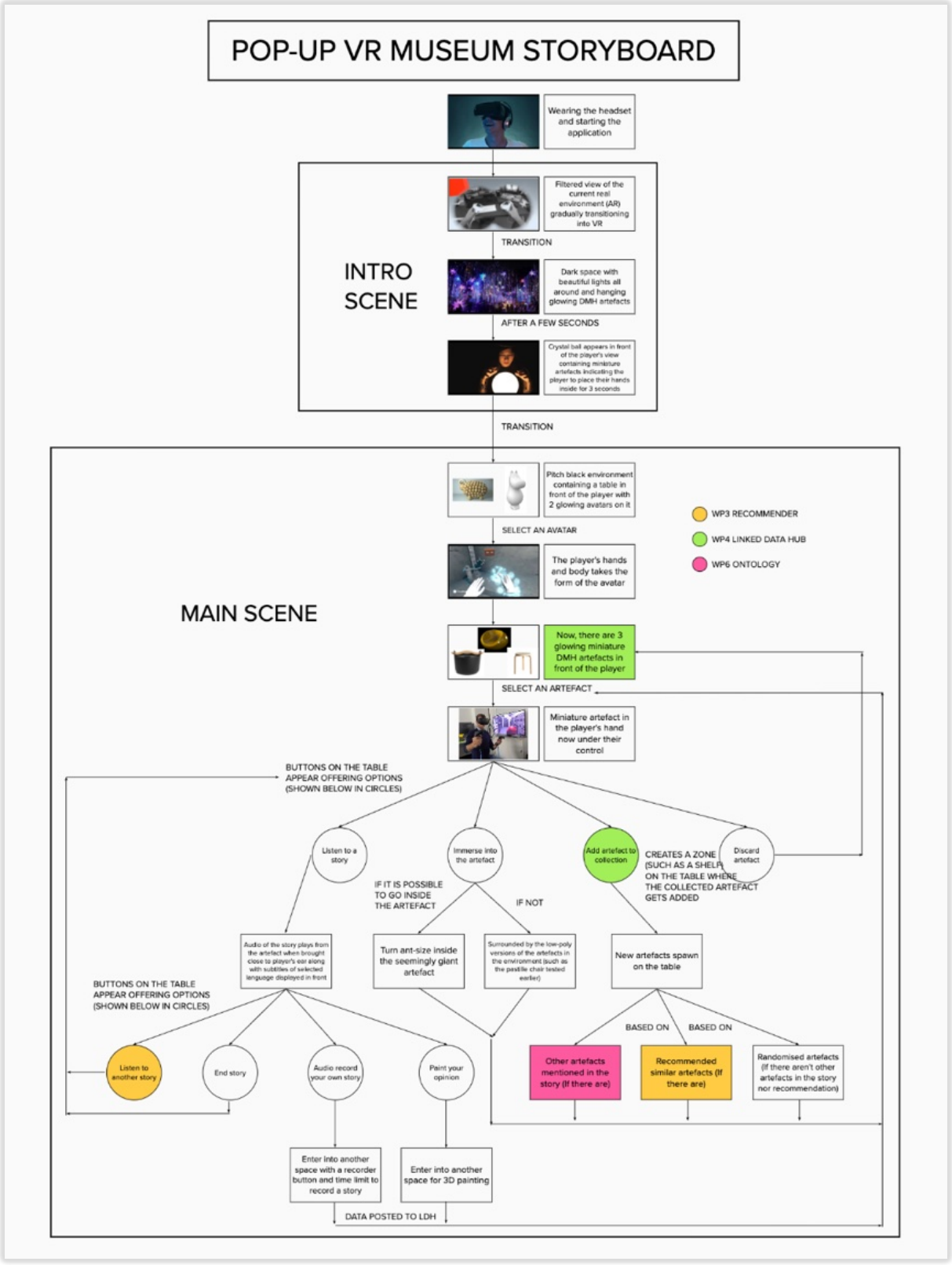

Fig. 8: The Pop-up VR Museum storyboard. An enlarged view of the storyboard is available to the consortium members here and a segmented version can be seen below between Fig.9 – Fig.11.

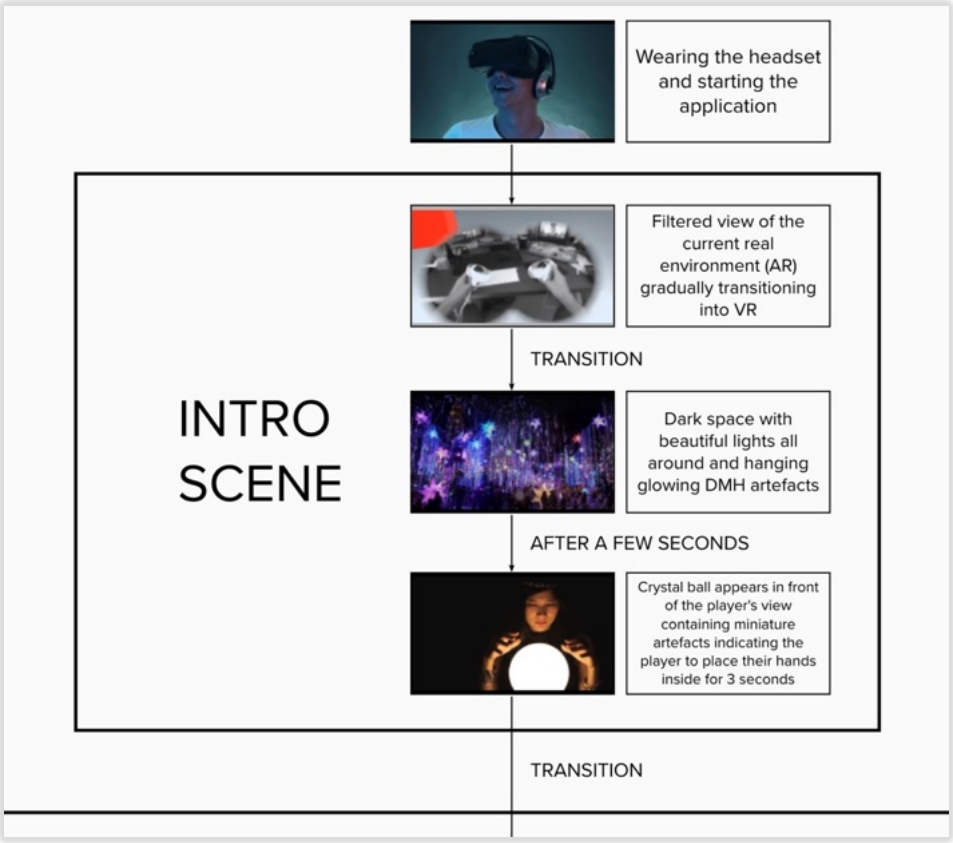

Fig. 9: The introduction scene as shown in the Pop-up VR Museum Storyboard. An enlarged view of the storyboard is available to the consortium members here.

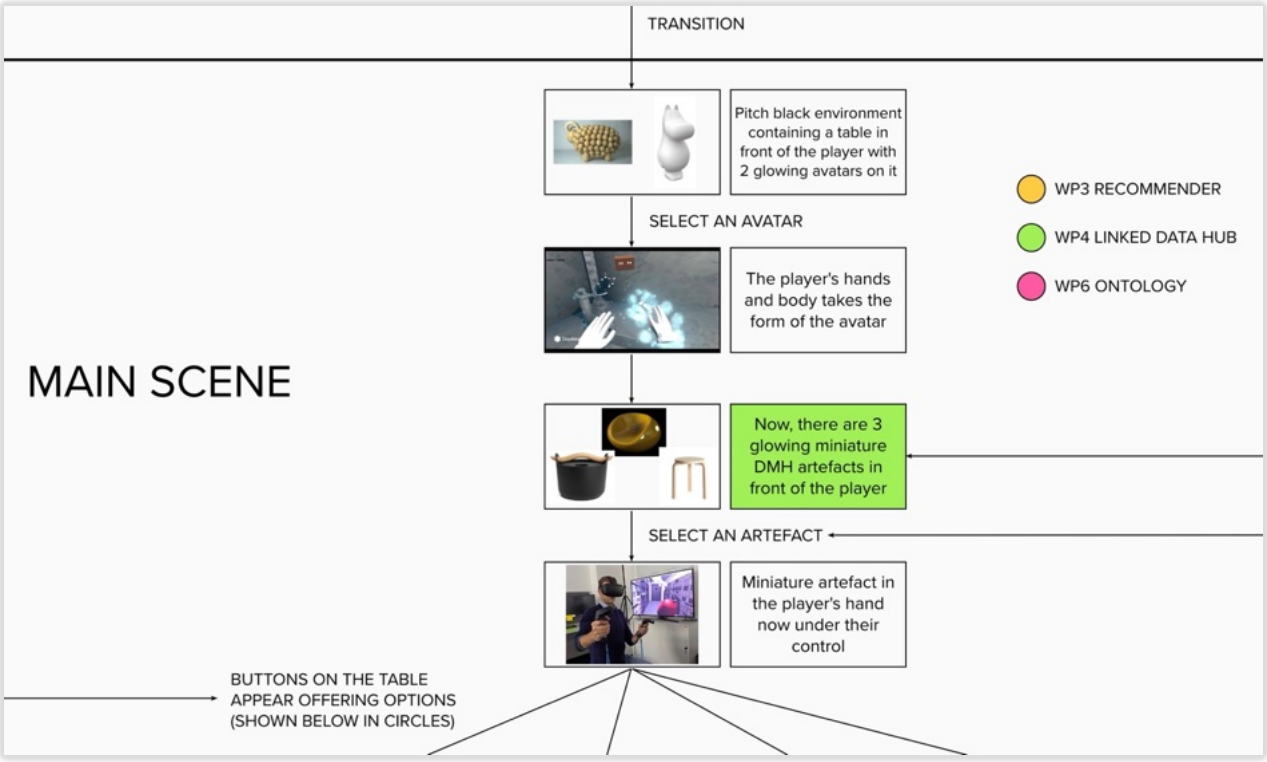

Fig. 10: The main scene as shown in the Pop-up VR Museum Storyboard. An enlarged view of the storyboard is available to the consortium members here.

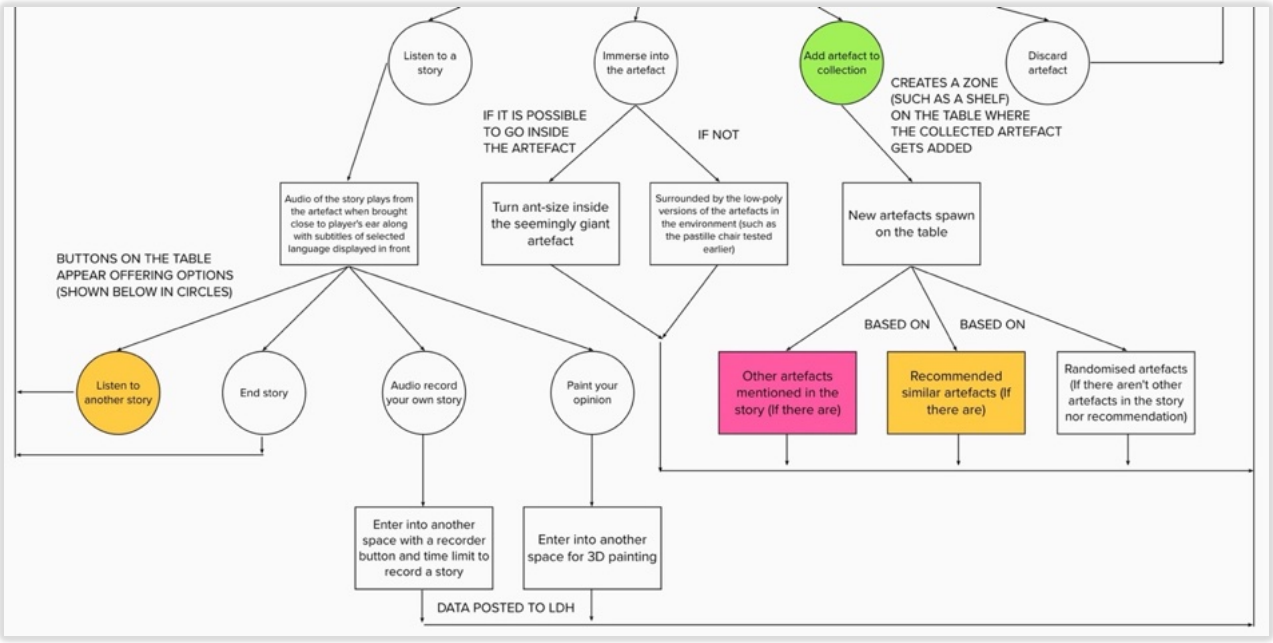

Fig. 11: The features available to a user/player as shown in the Pop-up VR Museum Storyboard. An enlarged view of the storyboard is available to the consortium members here.

Over the past few months, the team from Aalto and DMH have been using photogrammetry and other data acquisition techniques to digitize a selection of DMH's collection objects and make them available as interactive 3D models within the Pop-up VR Museum. So far, around 60 artefacts have been scanned and altogether approximately 100 objects will be available for users/players to engage with in the Pop-up VR Museum. Stories about these design objects in text and audio have been collected in co-design workshops with senior groups, and they will be shared in the Pop-up application. During the International Museum Week event conducted between May 17th – May 22nd, the Pop-up VR Museum will be on display for visitors and test groups at DMH, and more stories and reflections will be collected from the participants.

Aalto and DMH have co-designed a system to classify the artefacts while they are in the process of digitization. This classification takes place via a series of facets, namely:

1. Design Museum artefact and its attributes
2. History and specifications
3. Objects (Hierarchy derived from https://finto.fi/yso/en/)
4. Events and Action (Hierarchy derived from https://finto.fi/yso/en/)
5. Properties (Hierarchy derived from https://finto.fi/yso/en/)

In addition, there are two other categories important to the pipeline of the Pop-up VR Museum, namely:

1. Narratives
2. Interaction design for VR

An example encompassing some of the facet and additional categories can be seen in Table 17.

Fig. 12: A selection of Design Museum artefacts have been scanned and re-meshed to be used in the Pop-up VR Museum.

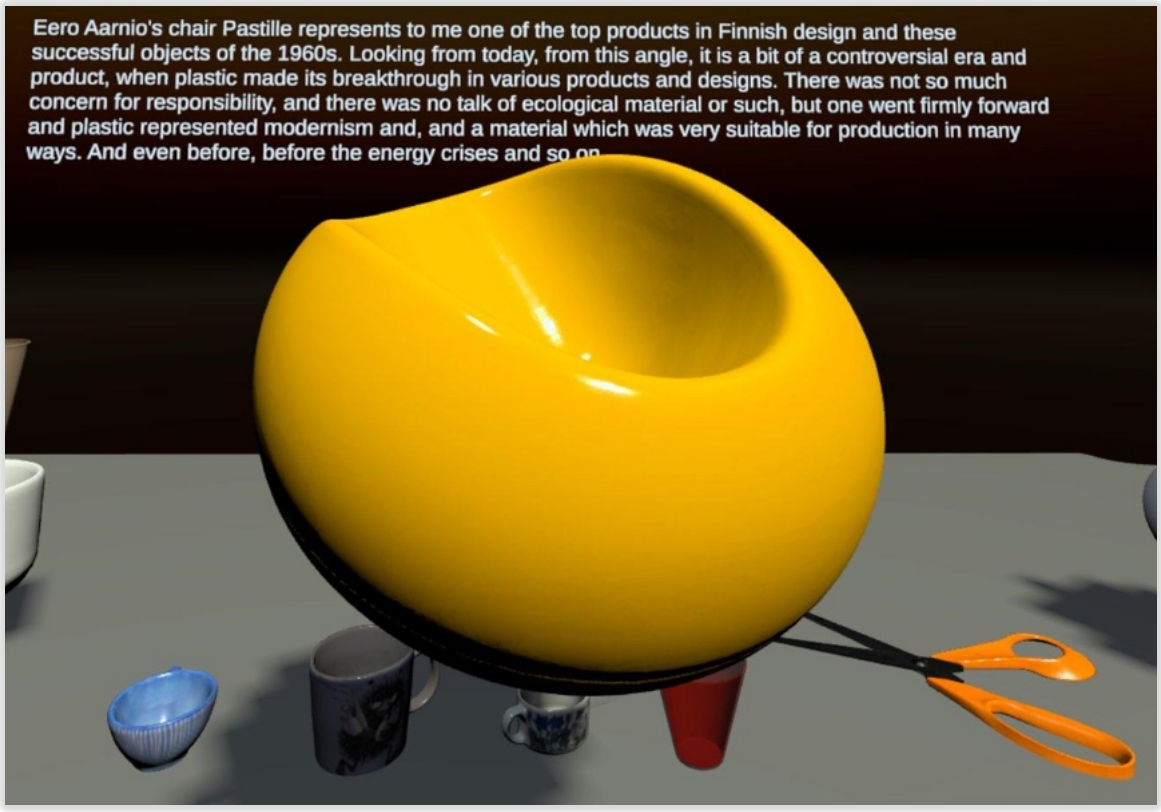

Fig. 13: A screenshot from an early prototype of the Pop-up VR Museum wherein a user interacts with an artefact and listens to a story of it along with translation as well as subtitles.

DESIGN MUSEUM ARTEFACT		
Object name	Pastille	The Last Supper
Image (Image URL when exported to JSON)		
Object type	Easy chair	Ceramic relief, art work
Special name	-	-
Photographer (Last name, first name; ++)	Träskelin, Rauno	Träskelin, Rauno
HISTORY AND SPECIFICATIONS		
Archive link (URL)	https://collection.designmuseum.fi/fi/item/tuoli-pastilli	https://collection.designmuseum.fi/fi/item/viimeinen-ateria
Inventory ID (Obtained from DMH's website containing an archive of their permanent collection)	42606	35971
Designer(s) (Last name, first name; ++)	Aarnio, Eero	Bryk, Rut
Object production date	1968	1950
Collection (Manufacturer, pattern/series, variant)	Asko Company; mass production	Arabia porcelain factory; Artwork, small series production

Object production organization	-	-
Site of production (Site, province, country)	Lahti, Päijät-Häme, Finland	Arabia porcelain factory, Helsinki, Finland
Description (Tags)	A chair circular in diameter, oval in profile with a pit-like recess. Made by molding. Color bright green.	Horizontal, flat. Built from six pieces. Wooden frame. Last Supper. Blue shades.
Dimension (LxWxH in cm)	92 x 92 x 53 cm	75 x 100 x 7 cm
Weight (kg)	10 kg	42 kg (ca)
Material(s) (Material name, material name)	Fibre glass, reinforced plastic	Faience, colored glazing
Dominant color(s) (Color code, color code)	#f5c12d	#273248
NARRATIVES AVAILABLE		
Museum	(URL for internal use)	(URL for internal use)
Popular	(URL for internal use)	(URL for internal use)
Autobiographical (Audio file name, .srt list)	(URL for internal use)	(URL for internal use)
Author (Name, end-user community)	(For internal use)	(For internal use)
Original language (FIN/SWE/ENG)	FIN	FIN

Translation language (FIN/SWE/ENG)	FIN, SWE, ENG	FIN, ENG

Table 17: Examples of two DMH artefacts (2nd and 3rd column) organized based on its facets (merged rows) and categories (1st column).

Time period	Workshops and activities
May – Aug 2021	June 16th: A workshop and testing event was conducted with one client and one mediator in Kustaankartano Senior Centre in Helsinki focused on the needs of institutionalized senior citizens aimed at understanding the level of interaction and use of sensorial digital applications such as VR. This workshop is described in greater detail in D7.3 – Case Studies Progress and Plan v2.0 (p.34). June 22nd: A workshop targeting non-institutionalized "free-going" senior citizens was conducted with DMH's mediators in the backyard of the museum wherein artefact analysis was employed as an interpretation method by asking participants to bring along their "Everyday Hero Object" presenting it to each other and triggering conversations that included storytelling. This workshop is also described in greater detail in D7.3 – Case Studies Progress and Plan v2.0 (p.36).
Sept – Dec 2021	Sep 7th: Co-designing session with WP7 to create a UX map of a persona profile. Dec 15th: Workshop with *Museum Ventilators*, DMH focus group with senior citizens conducted at DMH: using images of design objects interpretation in small groups and production of individual narratives that were documented using different media.
Jan – Apr 2022	Plenty of work was carried out with the development of the pilot application: Pop-up VR Museum. This includes 3D scanning of over 60+ artefacts, designing the storyboard which also includes the integration of the technical systems in SPICE, and developing the main features of the pilot using the Unity game engine. Jan 19th: Online workshop with *Museum Ventilators*, DMH focus group with senior citizens conducted via multimedia conferencing using Zoom and Miro: learning to use Miro, reflecting stories previously produced by other participants about specific design objects and re-interpreting objects. March 2nd: Workshop with *Museum Ventilators*, DMH focus group with senior citizens conducted at DMH: discussion about VR and reflecting work with objects in previous workshops. March 8th: Workshop for invited group of seniors in municipal library, Orimattila: using images of design objects interpretation as a group and production of individual narratives that were documented using different media; reflecting other people's stories using cards with stories from previous workshops.

	March 8th: Walk-in workshop in municipal library, Orimattila: Tell about the object! Using images of design objects participants were asked to tell their story or comment; annotations were written on post-it notes by mediators. March 15th: Workshop with group of seniors from The Finnish Association for the Welfare of Older People (Vanhustyön keskusliitto) at DMH: using images of design objects, interpretation in small groups and production of individual narratives that were documented using different media; reflecting other people's stories using cards with stories from previous workshops. March 17th: Workshop with *Happy Paintbrushes*, art group for seniors in Mukkula, Lahti: using images of design objects, interpretation in small groups and production of individual narratives that were documented using different media; reflecting other people's stories using cards with stories from previous workshops; individual interpretations were also made using painting and drawing as medium. March 22nd: Workshop with group of seniors from *Neighborhood circle* (Naapurustopiiri) in Maunula, Helsinki: using images of design objects interpretation as a group and production of individual narratives that were documented using different media; reflecting other people's stories using cards with stories from previous workshops; collective interpretation using poetry as medium. March 22nd: Workshop with group of seniors from *Neighborhood c*ircle (Naapurustopiiri) in Laajasalo, Helsinki: using images of design objects interpretation as a group and production of individual narratives that were documented using different media; reflecting other people's stories using cards with stories from previous workshops. March 29th: Online workshop for separately invited seniors conducted via multimedia conferencing using Zoom and Miro: using images of design objects, interpretation in group and production of individual narratives that were documented using different media; reflecting other people's stories using Miro board with stories from previous workshops.

Table 18: Workshops and activities conducted by DMH until the end of April 2022.

Time period	**Workshops and activities**
May – Aug 2022	May 12th Workshop for senior group organized in collaboration with Tampere City as part of A&DO Lab Senior Day programme: using images of design objects, interpretation in group and production of individual narratives that will be documented using different media; testing the Pop-up-VR Museum. We plan to organize also an open Walk-in workshop at the A&DO Lab. May 17th to 22nd: Pop-up-VR-Museum installation open to museum visitors and test groups at the DMH. Invited test workshops are planned to be organized with senior care experts, several senior groups and possibly a group of asylum seekers. July: Co-design workshop with WP7 to map the customer journey.

Sept – Dec 2022	During the fall: Co-design workshops including testing of the VR for invited groups at the DMH and visiting in City Senior Services and Immigrant Services Centers in the capital region. Dec end: Case Study set to be operationalized that involves the pilot of the Pop-up VR Museum fully functional and integrated with the SPICE technical systems.
Jan – Apr 2023	It is estimated that in 2023, a touring Pop-up VR Museum will celebrate the 150th anniversary of DMH collection, traveling to different remote cities and locations throughout Finland collaborating with cultural centers and libraries.

Table 19: Workshops and activities envisioned by DMH until the end of the SPICE project.

Fig. 14: On left column: Museum Ventilators focus group session at DMH (Photo Milja Nieminen). On right column: Workshop in the municipal library of Orimattila; above the Walk-in session in the library space and below the workshop with invited seniors. (Photos on the right column: Anna-Marja Karjalainen).

GAM

GAM is designing and developing GAMgame, a responsive web application that allows the Deaf community (primary end-user community of GAM) and other museum visitors to interpret GAM's collection using their own emotions. The pilot makes use of a prototype developed by GAM and UNITO, which employs a selection of artworks with associated emotions to invite users to create as well as share stories. To learn more about the GAM Case Study and its application of interpretation

and reflection methods, please visit D2.3 – Revised Methods for Interpretation, Section 2.0 – Case-specific applications of the Interpretation and Reflection methods.

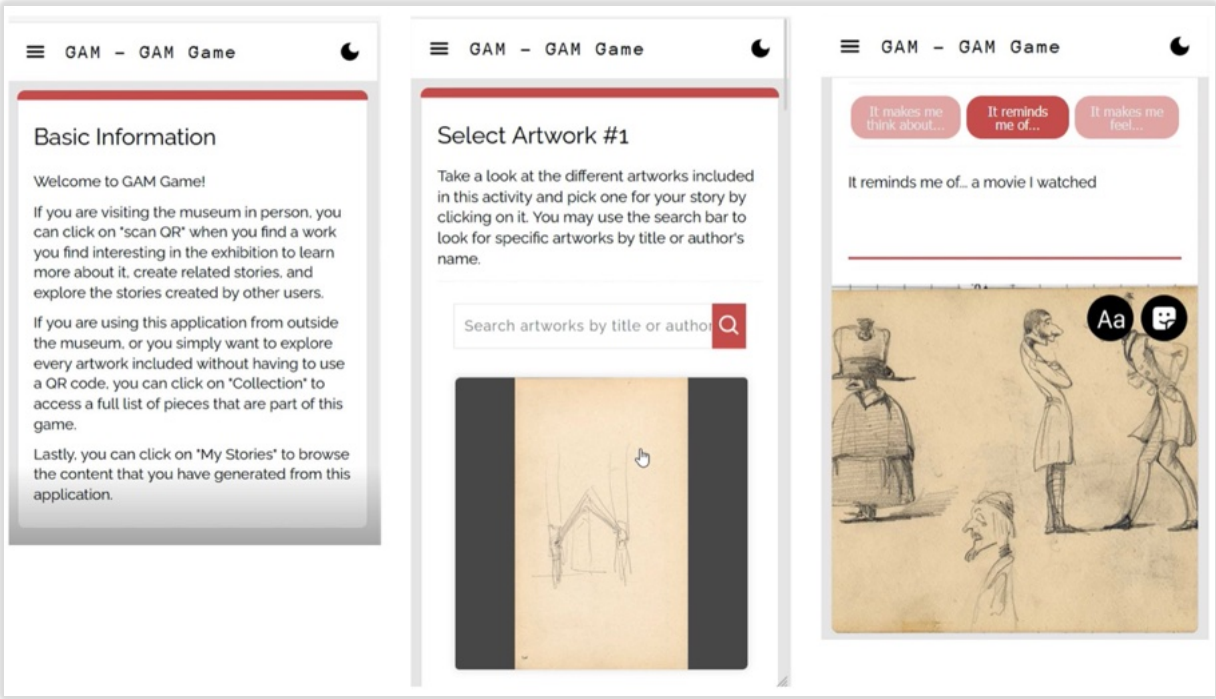

Fig. 15: A series of screenshots showcasing the GAM Game pilot (Image credit: GAM).

Time period	Workshops and activities
October 2020 – Aug 2021	October 2020: Collected and interpreted the responses of the web-app tests carried out with school groups. Working with UNITO and CELI to deepen the game and launch it with Google Form interface as well as broaden the database of emoticons. July: A focus group and two user study sessions were conducted to test the functionality and use of story creation in museum and educational contexts as well as collecting feedback and perspectives for redesigning the app. The participants included during a session conducted on July 8th, 2021, included a mixed group of deaf people and deaf people with mixed disabilities and on July 22nd 2021 included a mixed group of deaf teachers, both Italian and from different European countries. These sessions are further described in D7.3 v2.0 (p.38).
Sept – Dec 2021	Sep 14th: Co-designing session with WP7 to create a UX map of a persona profile. Throughout these months: Testing GAMgame with school groups, collecting responses and analyzing them.
Jan – Apr 2022	As soon as the first beta version of the web application was ready, the usability of the interface was tested out in two different group sessions: 1. A group of deaf students on March 9th, 2022. 2. A group of broader end-user communities such as general public/museum goers scheduled on March 22nd, 2022.

	These two sessions of testing also included testing the end-user interfaces, drafting, and developing interface for curators, and collecting feedback from the UX.

Table 20: Workshops and activities conducted by GAM until the end of April 2022.

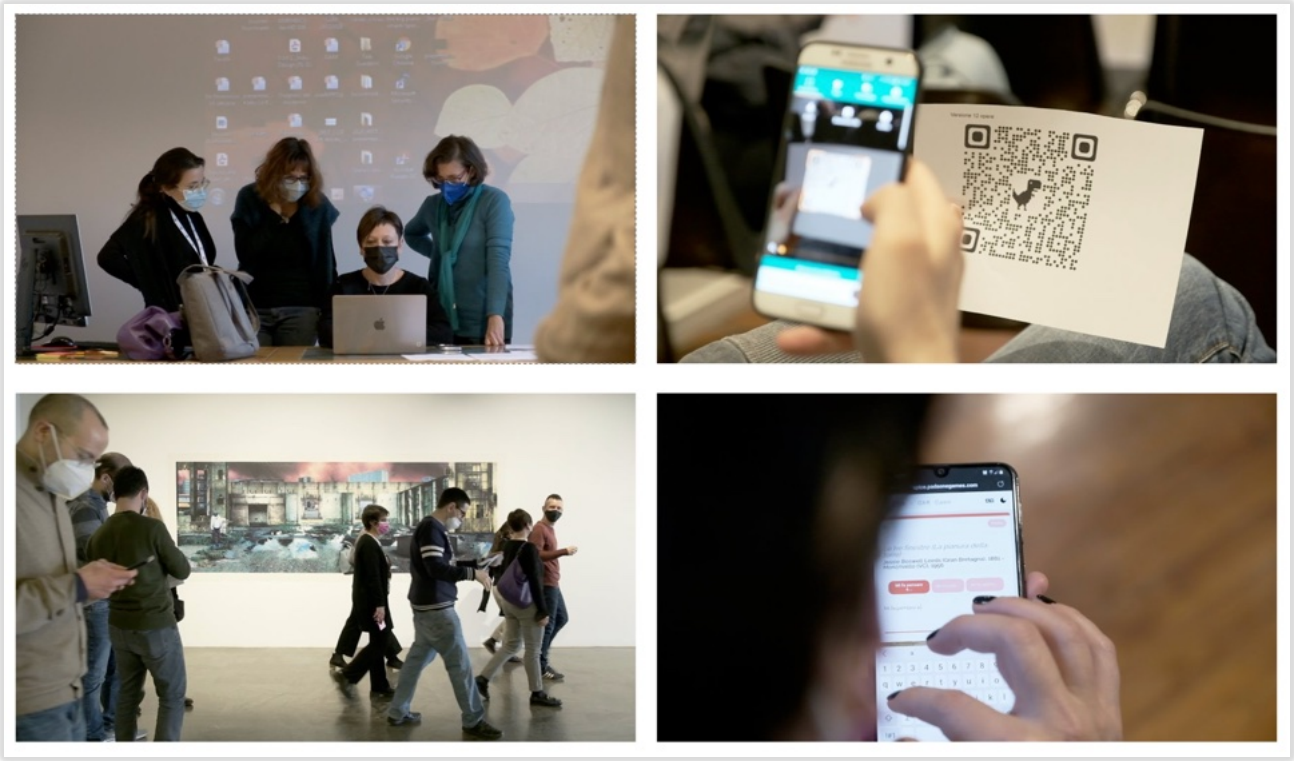

Fig. 16: Testing the user journey during a GAM user study session conducted on March 9th, 2022 (Photo credit: GAM).

Reflections on the workshops and activities conducted so far:

A deliberate decision was made to include choices/prompts for text and emotions and reduce the amount of elaborate articulation required while typing within the GAMgame. This decision was carried out because the Deaf community pointed out that the written language may sometimes be more complicated since sentences written in Italian follow a different structure compared to the Italian Sign Language (ISL). Hence, the textual input was cut down to be as minimal using templates and social media stories are more "synthetic" in the way text is used. On another note, even though GAMgame is prioritized for deaf teenagers as the primary end-user community, the web application will be tested on the public as well. However, a decision was made not to include the feature of uploading videos because it is more difficult for members of the deaf community (and of the public as well) to fully engage with.

From the user testing sessions, two types of feedback were collected through user observation via annotating the way interaction with the web application was carried out, and a questionnaire was provided to assess their experience quantitatively and qualitatively. This is currently being processed. Based on it, GAM will work towards concretely designing the reflection part of GAMgame.

Time period	Workshops and activities
May – Aug 2022	Further development and testing with a broader set of end-user communities will be carried out during this period to: 1. Validate the museum user journey. 2. Usability of the interface concerning the creation of the stories. 3. First draft of the recommendation model. July: Co-design workshop with WP7 to map the user journey. The 2nd user journey test will be used to analyze the feedback so as to understand specific changes and the inputs to be added to the web application. Other plans include: 1. Internal testing of the redesigned application. 2. Integration of the recommendation system. 3. Testing the interface for the curators.
Sep – Dec 2022	Sep: Co-design workshop with WP7 to create a service blueprint. Planned initial release of GAMgame and testing in the museum. Evaluation of and adjustments to the first release. Dec end: Based on the evaluation and further analysis, the second release (beta version) will be launched integrating all the SPICE technical systems.
Jan – Apr 2023	Planned launch of the project and several promotional activities. Collection of user feedback and organization of all the materials to document the whole process.

Table 21: Workshops and activities envisioned by GAM until the end of the SPICE project.

HECHT

The HECHT Museum is a small to medium-sized museum located at the university of Haifa's campus and is dedicate to the archaeology of the land of Israel. The dominant end-user community of the Case Study is 10th and 11th grade school students arising from religious and secular communities. In addition, other stakeholders and interest groups include students, teachers, and the museum curators. To learn more about the HECHT Case Study and its application of interpretation and reflection methods, please visit D2.3 – Revised Methods for Interpretation, Section 2.0 – Case-specific applications of the Interpretation and Reflection methods.

The main activity in the HECHT Case Study is the interpretation and reflection on two historical dilemmas regarding the Jewish rebellion against the Roman Empire at 66AD, a rebellion that started successfully, but was suppressed five years later ending with the destruction of Jerusalem. The students are shown a video recording that introduces the context of the historical dilemma and

asked whether the Jewish people should have rebelled against the Roman empire. In addition, the students are also asked to articulate their personal perspectives regarding the dilemma.

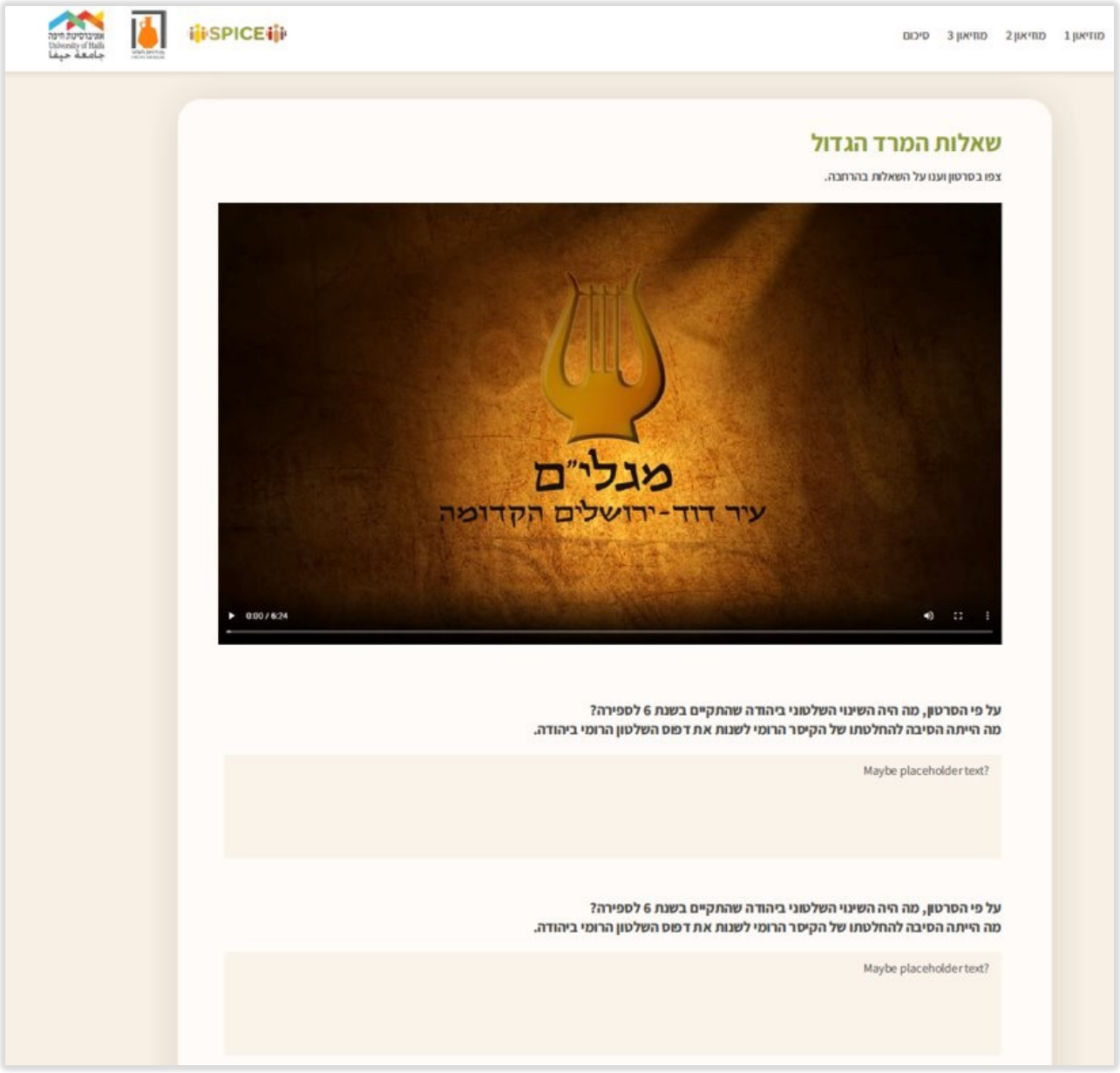

Fig. 17: A Graphical User Interface (GUI) in the HECHT Case Study wherein questions about the Jewish rebellion against the Roman empire are posed to the students (Photo credit: HECHT).

Upon articulating their perspectives, the students then select several exhibits that support their position, photograph them, and writing an historical argument using the items, eventually presenting them to their class. During the reflection part of the activity, the students are asked to reflect upon other perspectives regarding the historical dilemmas in which some of them are similar to their personal positions while others are different. Further on, to foster citizen curation, the students tag exhibits, explain their relevance, and critically analyze exhibits by presenting their interpretation about its agenda. Finally, the students create a virtual archaeological exhibition expressing their own view in the historical dilemma and their view about the HECHT Museum exhibition.

Fig. 18: A student who supports the rebellion describes the above artefact as "This is a coin from the independent state, 4 years to the rebellion. It is a proof that the rebellion supported a unifying myth for many years after. Thus, the rebellion helped maintain the Jewish nation to our days" (Photo credit: HECHT).

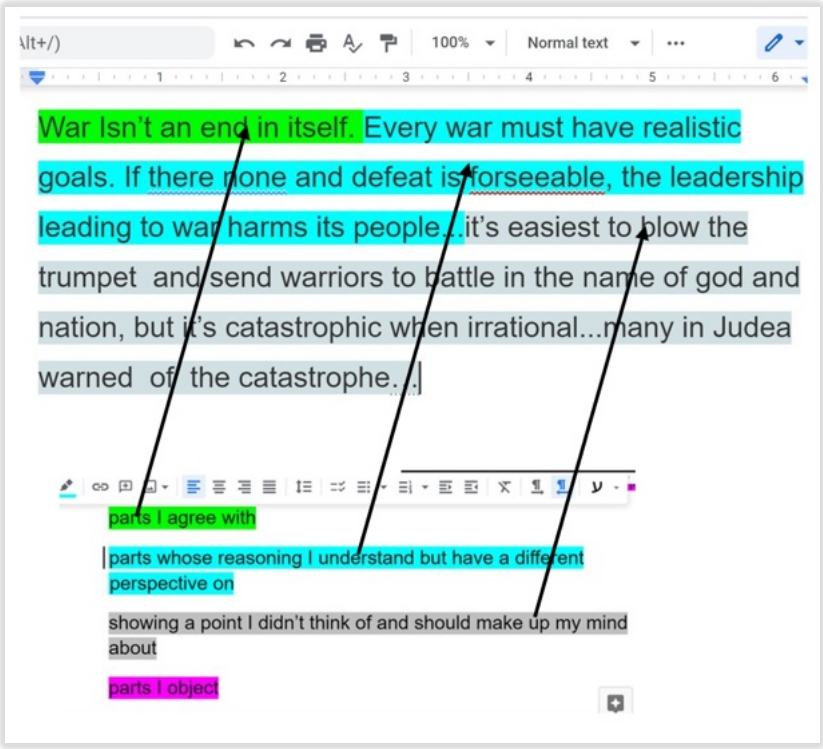

Fig. 19: Students addressing others' perspectives based on i) parts they agree with, ii) parts whose reasoning they understand but maintain different perspectives on, iii) points not thought about so deeply, iv) parts they object (Credit: HECHT).

Fig. 20: An artefact at the HECHT museum tagged by a student as: #a woman, #bone sculpture, #losing the war, #an innocent human lost her life (Credit: HECHT).

Time period	Workshops and activities
May – Aug 2021	Meeting school educators such as history teachers and education experts to discern the use of interpretation methods such as artefact analysis, duoethnography and visualization of opinions. This is further elaborated in D7.3 – Case Studies Progress and Plan v2.0 (p.40).
Sept – Dec 2021	Sep 29th: A Co-designing session was carried out with WP7 to create a UX map of a persona profile. The time between November-December comprised the 1st phase of the main activity which included: • Two schools comprising of 3 different classes altogether. • A total of 82 students engaging in the activity. • 3 teachers and 2 other educational staff members codesigning, mediating, and assisting. • Museum personnel who were also engaged and involved. The 1st phase was carried out via a pre-visit, museum visit, and a post-visit. During the pre-visit conducted by the schoolteachers: • The topic of the Galilei rebellion was introduced to the students by showing them videos along with background information and a critical understanding of historical sources. • The students were asked to provide opinion statements about the rebellion.

	• Lastly, the students filled in some of the demographic data, and the questionnaire about openness and historical relevance. During the museum visit: • Students toured the museum supported by tasks given to them on their mobile phones. • They were then asked to take photos of exhibits that supported their expressed opinions based on Collecting as an interpretation method (See D2.1 – Collecting). • Lastly, the students had to listen and read about the exhibits. This was oriented around Artefact Analysis as an interpretation method (See D2.1 _ Artefact analysis). Finally, during the post-visit phase, the students created a "virtual exhibition" and explained how it was curated.
Jan – Apr 2022	Feb-March: Clean and coding data of opinions from the testing session with school students. March: Statistically analyzing opinions collected. March (mid): Organizing another round of testing with 2 more schools that includes 4 classes and a total 120 school students. March – April: Integrating WP4, semantic analyzer and other SPICE technical components into the application.

Table 22: Workshops and activities conducted by HECHT until the end of April 2022.

Fig. 21: Pre-visit wherein students are shown videos containing background information about Galilei rebellion (Photo credit: HECHT).

Fig. 22: Students carrying out the museum activity, presenting their chosen artifacts to other students (Photo credit: HECHT).

Fig. 23: An example of pictures of artifacts from the museum taken by a student for substantiating their opinion not to rebel wherein the student states the following: “The romans had stronger weapons and were way more equipped. There was no chance for the rebellion to win” (Photo credit: HECHT).

Fig. 24: An example of pictures of artifacts from the museum taken by a student for substantiating their opinion to rebel wherein the student states the following: “One of the things that support my opinion for the rebellion is the Jewish symbolism. It reminds me of the miracles and the victory of the Jews over the Romans and the fact that all the nation was united and trusted God to help them” (Photo credit: HECHT).

Fig. 25: Post-visit activity wherein a student creates a ”curated virtual exhibition” by stating “i) Humiliation and contempt of the Romans for the Jews, the theft of money from the Jews, the destruction of the Jewish religion, ii) We used the Roman soldier and put him next to the Jews so it will look as if he is chasing them, iii) We used a sword because it's a war, iv) We used Herod because he is the leader of the Romans” (Photo credit: HECHT).

Reflections on the workshops and activities conducted so far:

Based on the data obtained from the user testing session and interviewing educators, the researchers noted that the students were most excited about taking photos for tagging and curating their own exhibition. Several other stakeholders such as the teachers were also satisfied and highly involved in engaging with the curriculum. Teachers commented most favorably about the reflection on others' opinion activity, saying that it requires deep thinking and reflection from the students. The researchers noted the importance of codesigning and involving all stakeholders.

Time period	Workshops and activities
May – Aug 2022	Integration of the data that is gathered in the case study will be done with the user model and the linked data hub. Further development will be done of the student manager – an interface that allows the teachers and curators to view the data and view recommendations for content. July: Co-design workshop with WP7 to map the customer journey. June: co-design workshop with curators and teachers to gather their needs for using the data
Sept – Dec 2022	Sep: Co-design workshop with WP7 to create a service blueprint. Oct: co-design workshop with teachers to receive their feedback on the student manager. The pilot would be ready and running in HECHT museum.
Jan – Apr 2023	Planned analysis, final iteration, and write-up of the results.

Table 23: Workshops and activities envisioned by HECHT until the end of the SPICE project.

IMMA

The IMMA Case Study supports visitors to use the museum's collections to develop their own perspectives and share them with others to help people appreciate alternative points of view. The Case Study focuses on supporting groups from marginalized or under-served communities as well as those who lack access to the museum.

IMMA is codesigning the *Deep Viewpoints* web application with the underrepresented groups. This application intends to provide participants with the opportunity not only to interpret artworks by taking part in longer-form scripts, but also to author their own scripts using a mediation process as a mechanism of providing their own perspective.
Engagement and codesign involves the following end-user communities:

- Migrant groups
- Black & Irish organization
- LGBTQ+ groups
- Healthcare workers

- Asylum seekers
- Young people in detention
- Young people living with life-long illnesses

Some of the above-mentioned communities could also be described as communities of interest (COI) and communities of practice (COP) (D7.1 – Evaluation Protocols, p.11 – p.16). To learn more about the IMMA Case Study and its application of interpretation and reflection methods, please visit D2.3 – Revised Methods for Interpretation, Section 2.0 – Case-specific applications of the Interpretation and Reflection methods.

Time period	Workshops and activities
May – Aug 2021	May: Feedback from the stakeholders was received for the Slow Looking activities conducted in April and May. Some of them include: i) group vs individual dynamics, ii) importance of the facilitator/mediator for under-served communities, iii) humor as a tool, iv) empathy requires personal connection that includes the voice of the artist, v) empathy requires slowing down, therefore curating a relaxed space for visitors to respond is essential. July: The first prototype, IMMA Viewpoints, was launched and tested as a part of a summer programme wherein visitors could access the web app online and respond to outdoor sculptures as well as view other users' responses; in addition, a public screen presented a live feed of responses as well as visualization of some of the data. This event is described in further detail in D7.3 v2.0 (p.43). Aug: Working with community groups to plan out an exhibition wherein members can select from and create their own theme for activities. Planning the stages of a detailed version of IMMA Viewpoints prototype.
Sept – Dec 2021	Sep 27th: Co-designing session with WP7 to create a UX map of a persona profile. Nov 24th and 27th: workshops with the Migrant Women Opportunities for Work group and the organization Black and Irish in which the groups authored their own script (mediation) and responded to the scripts of others (interpretation).
Jan – Apr 2022	Feb 12th: IMMA workshop with the Black Queer Bookclub wherein artworks that are not part of IMMA are added to IMMA Viewpoints and this process would be used to develop an exhibition. An activity was conducted by Black Queer Bookclub called Queer Reflection which provided an institutional critique of IMMA based on the portrayal of certain artworks. Feb 16th: Pre-workshop visit from participants in the MELLIE (Migrant English Language, Literacy, and Intercultural Education) Programme via Dublin City University. This Programme brings together staff and students from the university and people seeking asylum in Ireland. The pre-workshop involved young Afghan women going through the gallery and choosing images to interpret through different perspectives. These two workshops gathered interesting feedback and perspectives as well as generated ethical questions about designing activities. March 26th: Workshop with the Youth Advisory Group of HELIUM Arts, an organization providing creative opportunities to young people with life-long

	illnesses. After discussion with the group, this workshop was delivered entirely remotely to maximize participation for the young people, many of whom are particularly vulnerable to Covid-19. March 11th – April 1st: series of four workshops with young people in Oberstown Children's Detention Campus. In these workshops, participants used the Deep Viewpoints web app to mediate their own paintings and develop connections between their work and works in the IMMA Collection. The scripts authored by this group will be integrated into a physical exhibition of their work at IMMA in April-May 2022, as well as being accessible to other groups in future workshops. April: Planning workshops to be conducted with healthcare workers that involves discussions of themes for four (4) different exhibitions and potential use of SPICE tools in hospitals for patients.

Table 24: Workshops and activities conducted by IMMA until the end of April 2022.

Reflections on the workshops and activities conducted so far:

IMMA has begun building a bank of citizen contributions through scripts and responses to scripts. This would allow museum visitors to browse and explore how others have responded to the same questions. It would also enable the voices of marginalized group of young people to be captured digitally and integrated into the physical gallery space.

Another key insight worth noting is how different end-user communities as well as demographics respond to themes and author activities. For example:

A group of participants from Migrant *Women* - Opportunities *for Work* (Mi-WOW), showed the potential for revitalizing museum objects by contributing new layers of meaning. One of the works Mi-WOW included in their script was Alice Maher's *Berry Dress*. The work, a child's dress, decorated with berries that have withered and dried over time, was first introduced to the group through a script authored by IMMA. The IMMA-authored activity framed an understanding of the work in terms of temporality, focusing on the passage of time and the loss of childhood innocence – "What happens to berries over time?". However, the participants took a different view of the significance of the artwork. The questions they posed focused on the meaning not of the dried berries on the outside of the dress, but on the needles within; for Mi-WOW, these pointed to bodily, uterine pain. "Look inside the dress at the needles and describe how you feel." Selecting the theme of 'Activism', their script reframed the work as political and feminist, their questions opened discussions of bodily autonomy and reproductive rights.

A group of Afghan refugees living in the Mosney Direct Provision Centre used the lens of war and peace to mediate an exhibition with an ostensibly different set of concerns. Exploring 'Chapter 2: the Anthropocene', an IMMA exhibition exploring human impact on the earth and climate change, their script invited visitors on a "short tour of four pieces that look at different feelings of peace". The script looked at *Dulce et Decorum est…*, a work by John Kindness in which homeless Vietnam veterans are pictured on the yellow bonnet of a New York City taxi. Here, they focused not on the representations of the veterans but on the object itself, likening the car bonnet to a metaphor for soldiers and civilians on the front line of war, those first to feel war's impact.

On an ethical standpoint, one of the groups was keen on sharing critiques of the exhibition and uncomfortable gaps that they came across. In developing a script, 'Queer Reflections', Black Queer Book Club, a reading group based in Dublin, pointed at perceived gaps in the exhibition's representations of race and included an artwork from an artist outside the IMMA Collection as a suggested corrective to a perceived lack of representation from Black LGBTQ artists. These are valid and important perspectives that may not emerge clearly within the institutions. IMMA began reflecting more about dealing with difficult/triggering subject matter and how to carry it out sensitively. Questions were also posed regarding what the main role is of an IMMA facilitator, and this would also be delved into by extending the lengths.

Time period	Workshops and activities
May – Aug 2022	July: Co-design workshop with WP7 to map the customer journey. April – May: workshops with health care workers
Sept – Dec 2022	Sep: Co-design workshop with WP7 to create a service blueprint. September – November: workshops with Irish Traveler group. IMMA is planning to work with a local Traveler group, applying the same methodology across a longer time period to explore whether this substantially changes the quality or character of scripts produced by the group. Dec end: IMMA Deep Viewpoints fully operational along with the integration of SPICE technical systems.
Jan – Apr 2023	In 2023, using the Response Room in IMMA and partnering with the museum's visitor engagement team, engage individual visitors and groups with SPICE system and tools. IMMA will engage partner groups and organizations with disseminating results from their case study.

Table 25: Workshops and activities envisioned by IMMA until the end of the SPICE project.

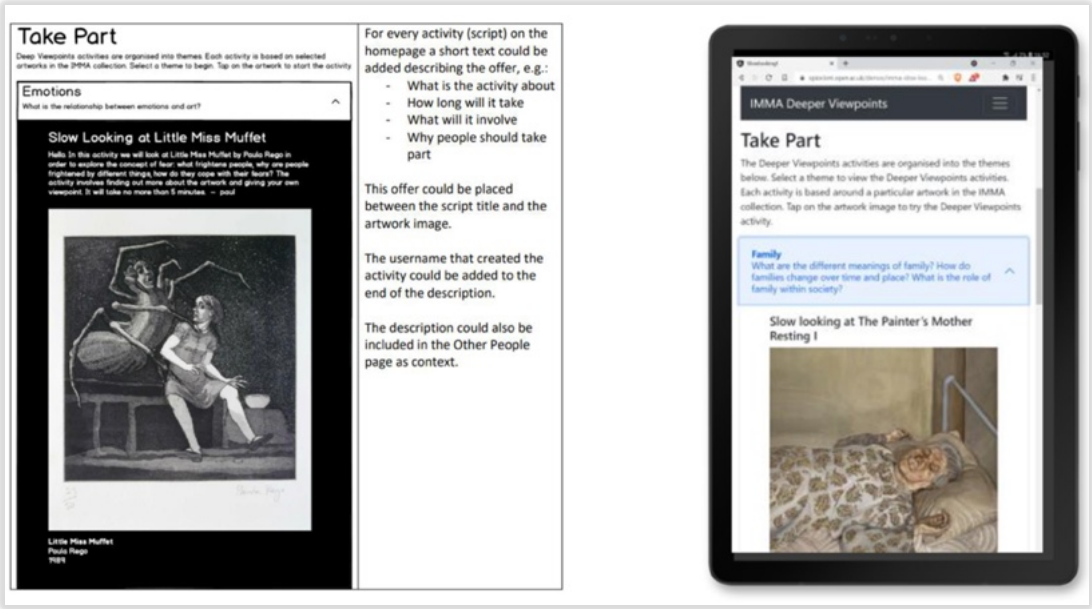

Fig. 26: Initial stages of the design and development of IMMA Deep Viewpoints prototype (Image credit: IMMA).

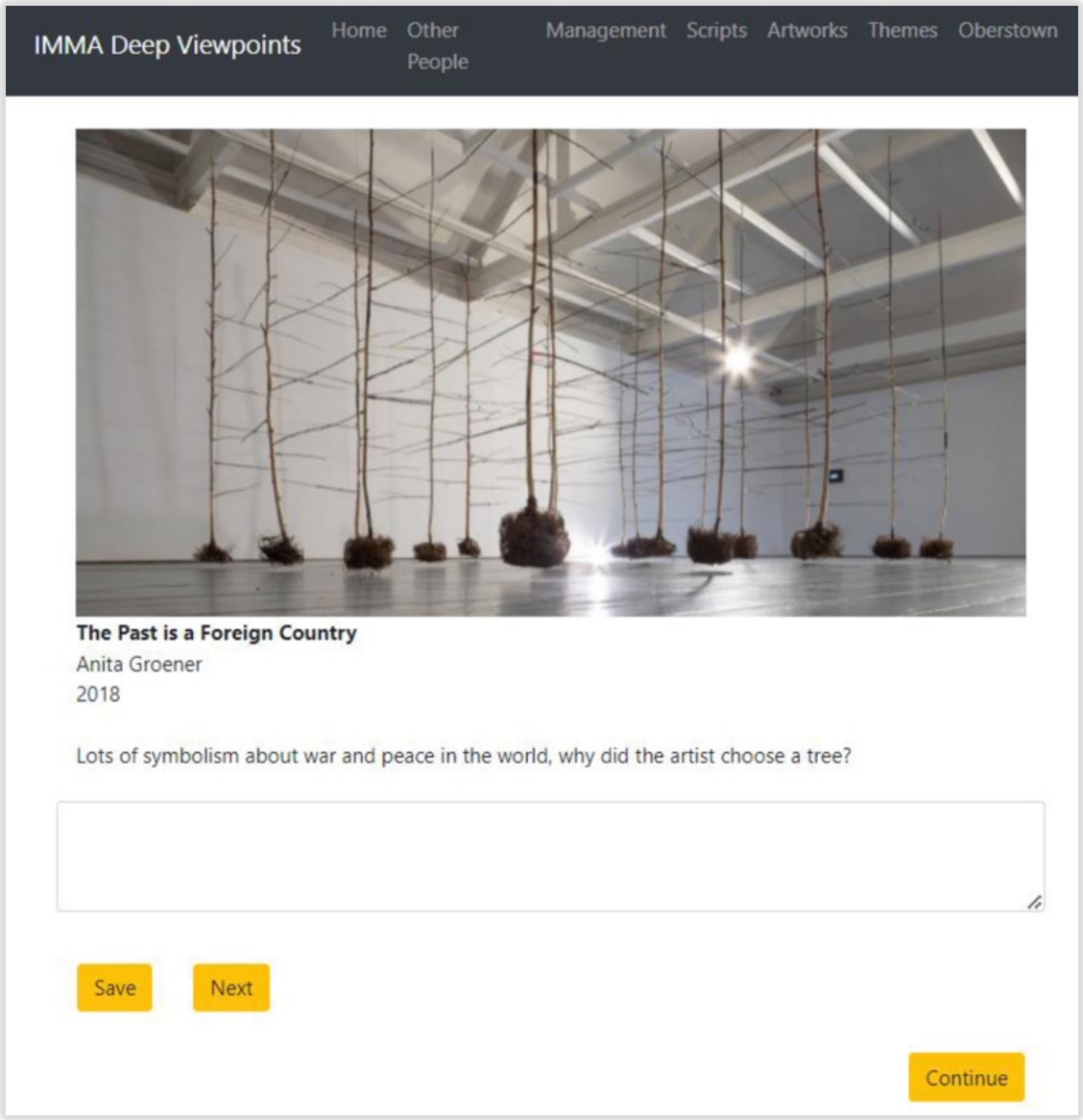

Fig. 27: A screenshot of the IMMA Deep Viewpoints web application (Image credit: IMMA).

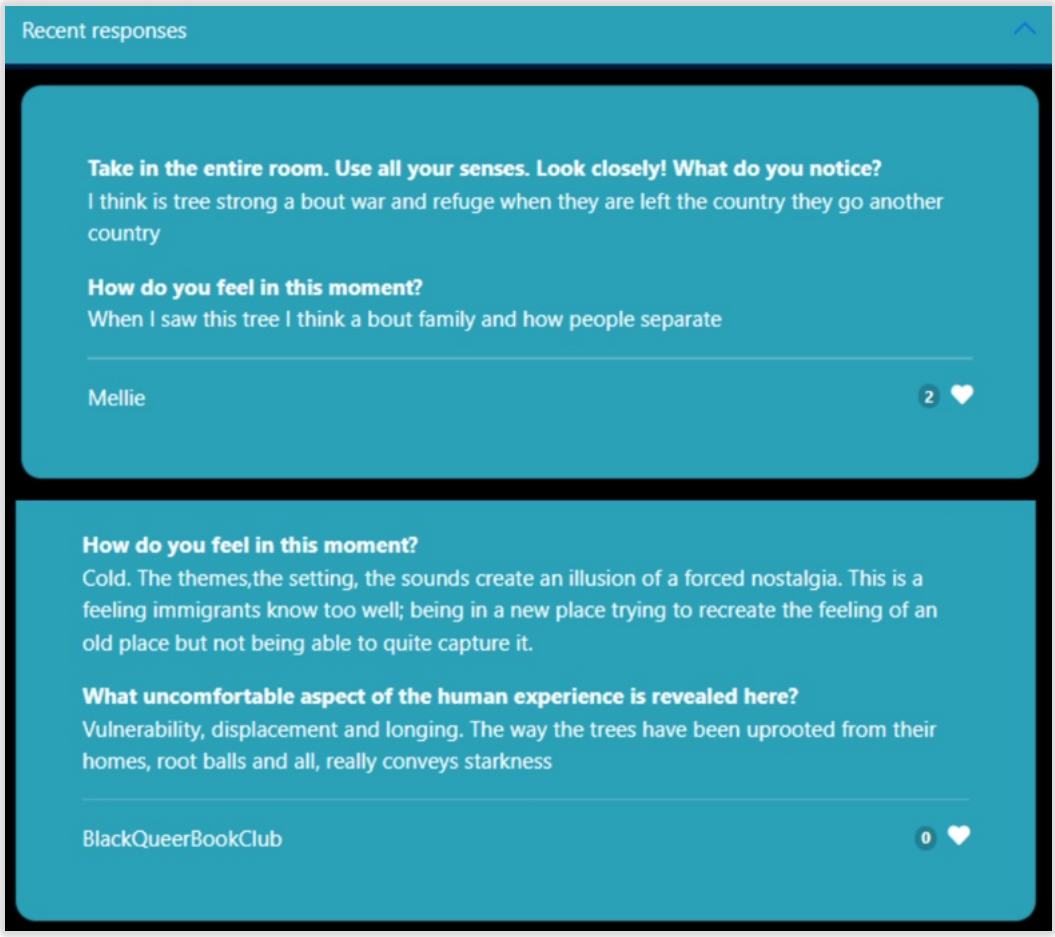

Fig. 28: Examples of responses received on IMMA Deep Viewpoints (Image credit: IMMA).

Fig. 29: Participants testing the IMMA Deep Viewpoints web application (Photo credit: Louis Haugh and Kyle Tunney).

MNCN

MNCN describes their Case Study as attempting to support schoolteachers to explain to their students how to interpret scientific evidence of the past and present and see how the choices we make today will live far beyond us, in deep time. Thus, discovering how human actions are driving Earth's rapidly changing climate today much like long-ago geological events did in the past. MNCN's aim is for schoolchildren to understand the importance of the Conservation Movement's motto: "Think globally, act locally"[3]. To learn more about the DMH Case Study and its application of interpretation and reflection methods, please visit D2.3 – Revised Methods for Interpretation, Section 2.0 – Case-specific applications of the Interpretation and Reflection methods.

The Treasure Hunt pilot designed by MNCN is envisioned around a gamified visit to a Science Museum supported by a mobile device wherein students search for hidden real and virtual objects by following a trail of clues. The Treasure Hunt interleaves the search for objects in the museum with explanations and questions. Although the school students are the primary target group, schoolteachers play a very important role in this pilot. After the visit wherein the students engage with the Treasure Hunt, teachers would ask the students to author a narrative piece reflecting on the experience at the museum. Thereby, the teachers will be able to encourage student reflections by analyzing the answers they provided to the questions in the game, and this may uncover common misconceptions.

Time period	Workshops and activities
May – Aug 2021	PadaOne Games and UCM working with the Education department from the Science Museum to co-design an initial draft of the Treasure Hunt script as well as development of an app for mobile devices based on that script. This is described in further detail in D7.3 – Case Studies Progress and Plan v2.0 (p.44).
Sept – Dec 2021	Sep 28th: Co-designing session with WP7 to create a UX map of a persona profile. Nov 3rd – 7th: Tested the Treasure Hunt app at the Madrid Science Week with six groups of students and collected data as well as received feedback from schoolteachers who will be involved in co-design.
Jan – Apr 2022	Jan: Processing answers from the students at the Madrid Science Week testing. Feb-March: Designing the Treasure Hunt authoring tool with schoolteachers. April: Preparing a demo, deciding activities, and demonstrating the Treasure Hunt at MNCN Science Congress.

Table 26: Workshops and activities conducted by MNCN until the end of April 2022.

Reflections on the workshops and activities conducted so far:

On the positive side, MNCN has seen that the mixture of play phases with reflection phases during the game works well. On one hand, they managed to keep the children interested in the activity because of its playful component, but, on the other hand, we also managed to get them to pay attention to the explanations of the museum educators. Regarding aspects to improve or develop,

[3] Ute Collier, Ragnar E Löfstedt, Think globally, act locally? Local climate change and energy policies in Sweden and the UK. Global Environmental Change, Volume 7, Issue 1, 1997, Pages 25-40

MNCN seeks to think of ways to improve the questions that are interspersed in the game and to alleviate in some way the children's bias to please the adults with their answers.

Time period	Workshops and activities
May – Aug 2022	May-June: Additional testing of the treasure hunt with new groups of students, recruited at the MNCN Science Congress. July: Co-design workshop with WP7 to map the customer journey.
Sept – Dec 2022	Sep: Co-design workshop with WP7 to create a service blueprint. Online workshops envisioned with end-user communities that include: 1. MNCN museum educators. 2. School teachers and children from schools in the rural area. Oct-November: A call sent through MNCN to bring additional schools to test and evaluate the digital tools. Dec end: Treasure Hunt fully operationalized integrating the SPICE technical systems.
Jan – Apr 2023	Recollection and analysis of narrative pieces from students, probably through a contest.

Table 27: Workshops and activities envisioned by MNCN until the end of the SPICE project.

Fig. 30: Students attending the Madrid Science Week held during the first week of November 2021 at MNCN (Photo credit: MNCN).

Fig. 31: User contributions obtained from the testing of the MNCN Treasure Hunt app during the Madrid Science Week (Image credit: MNCN).

6 – RESEARCH AND DEVELOPMENT ACTIVITIES RELATED TO THE CASE STUDIES

WP2 – Citizen curation methods and the reflection process

WP2 is focused on the Interpretation and Reflection loop (IRL) used for citizen curation. A set of methods were envisioned proposed to the Case Studies prior to mini-conference 2 conducted on March 23rd, 2021 (see D2.1 – Initial Methods for Interpretation, D2.2 – Initial Methods for Reflection, and D7.3 – Case Studies Progress and Plan). Case Studies were then tasked with the selection of these methods and describing the reasoning for the selection. The responses collected are displayed in Table 28 and Table 29.

Interpretation methods selected by the Case Studies:

METHOD	DMH	GAM	HECHT	IMMA	MNCN
Artefact analysis					
Visualization techniques					
Collecting methods					
Narrative methods					

Table 28: Interpretation methods selected (in green) by the Case Studies as a pre-requisite to mini-conference 2.

Reflection methods selected by the Case Studies:

METHOD	DMH	GAM	HECHT	IMMA	MNCN
Cultural semiotics					
Narrative identity					
Duoethnography					

Table 29: Reflection methods selected (in green) by the Case Studies as a pre-requisite to mini-conference 2.

The selection process, application of the methods, and revisions are described in extensive detail in D2.3 – Revised Methods for Interpretation. Based on these methods, WP2 codesigned Workshop 3 (WS#3) wherein each Case Study was tasked with designing their concrete interpretation and reflection activities into "user-journey script(s)" (see D2.3 – Revised Methods for Interpretation). Some of the key objectives of WP2 WS#3 was mapping different the IRL workshops and activities envisioned in the form of testable scripts and supporting social cohesion paradigms across each Case Study (see D2.4 – Revised Methods for Reflection).

The process of designing and developing user-journey scripts was partly carried out by conducting bilateral meetings with each Case Study as well as through tailored homework tasks. Eventually, WP2 WS#3 culminated in a plenum meeting with all the Case Studies and the partners of the consortium. The plenum meeting was an engaging and fruitful session for the Case Studies to garner feedback about their user-journey scripts as well as activities envisioned in relation to social cohesion. It was also a good opportunity for the technical partners in SPICE to understand the nature of each Case Study and derive requirements. Overall, the Case Studies sought to iterate and test their user-journey scripts in WP2's Workshop 4 (WS#4).

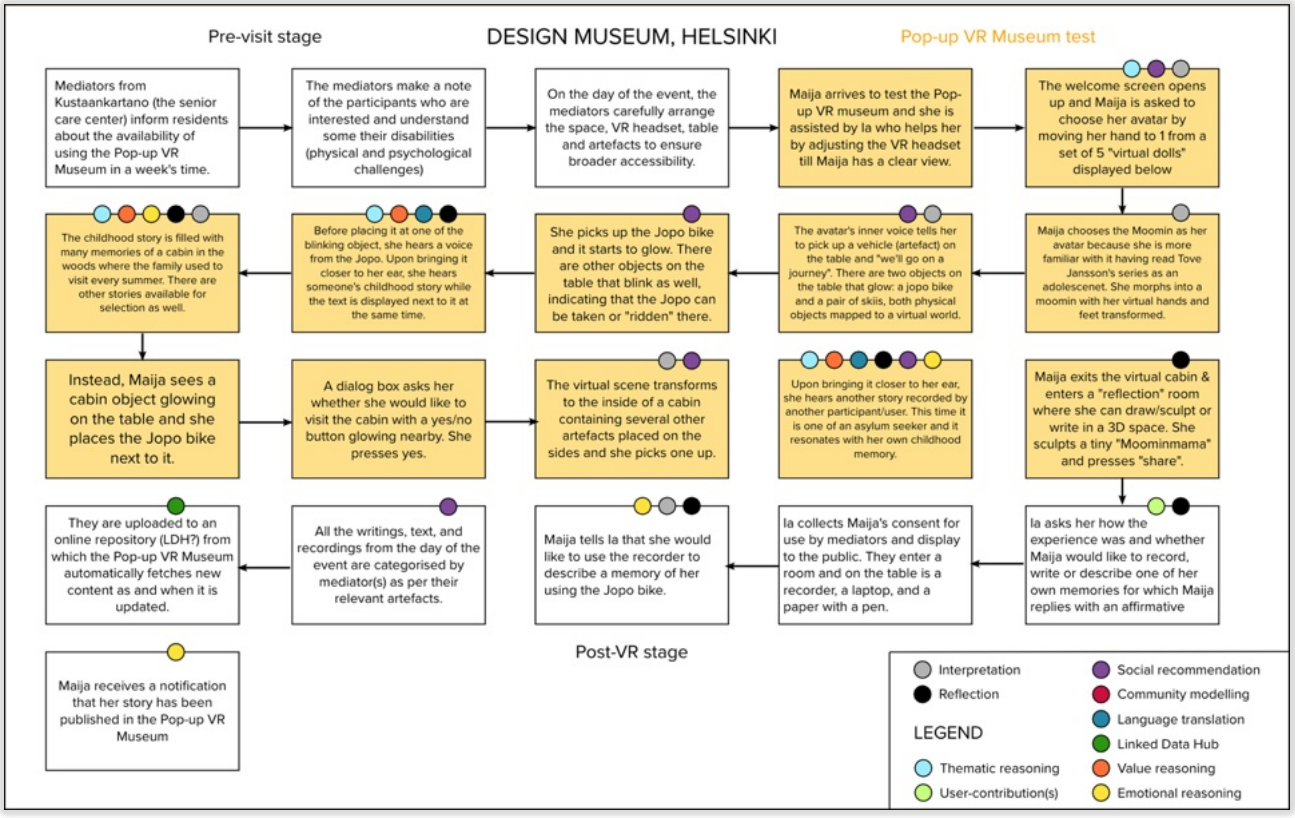

Fig. 32: An example of a user-journey script of DMH demonstrating the steps within the journey along with a legend outlining the interaction of SPICE technical systems in each step.

Please refer to D2.3 – Revised Methods for Interpretation to see the user-journey scripts of the other Case Studies.

WP3 – Developing user and community models for social recommendation

WP3 is a technical WP in SPICE focused on developing infrastructure that may collect or elicit a user or a community's characteristics, behaviors, and preferences. The core systems in WP3 include the:

1. User Modeler
2. Semantic Annotator
3. Community Modeler
4. Social recommender

1. The user models devised in WP3 represent the individuals that are interacting with the SPICE front-end systems and are key elements used to guide the process of content recommendations to end-users taking into considerations their interests as well as script guidelines (see D3.3 – Final user and community models).

The User Modeler in each Case Study includes:

- Characteristics of a user.
- Types of groups a user engages with.
- Characteristics of a user derived from the group visiting with.
- Interactions between a user and the Case Study's software application's front-end systems.

- Properties of a user that can be derived from a user's interactions with the Case Study's software application's front-end systems.

2. The Semantic Annotator aka SPICE Semantic Annotator (SSA) is an annotation service for the semantic enrichment of textual contents, targeting user generated contents as well as descriptions of museum artefacts (see D3.4 – Final semantic annotator).
The Semantic Annotator in each Case Study seeks to capture:

- Textual input provided by a user that is of interest to the Case Study.
- Whether a Case Study is interested in sentiments or emotions or both.
- A list of synonyms in the native language that the Case Study is interested in.

3. In SPICE, communities are defined as "groups of users with shared characteristics" (see D3.3 – Final user and community modelling). In addition, WP3 also state that "all the citizens in the same community share certain attributes" and "this set of shared attributes depends heavily on the data set and characteristics of a case study".
On this note, the Community Modeler in each Case Study seeks to identify:

- Explicit groups in the Case Study.
- Possible implicit groups in the Case Study.
- Data collected that could support classification in an implicit group.
- Groups that are of interest to the Case Study.

Here, explicit communities refer to the ones that users are "asserted" to belong to, and implicit communities are the ones "inferred" to belong to (see D3.3 – Final user and community modelling).

4. To put it simply, social recommender seeks to "provide recommendations for content to the visitor whenever there is a request" (see D3.6 – Prototype community recommender).
The Social Recommender in each Case Study includes:

- Purpose for which recommendation may be required (provoke, empathize, encourage, participation, general, other).
- Recommendations of the types of user generated content that are of interest to the Case Study.
- Whether explanations of the recommendations would be helpful.
- Whether a digital nudge for the recommendation would be helpful.
- Source of the diverse views, whether they would be from groups that are similar to the user demographically (explicit communities) or from citizens that have similar interactions (interests, emotions) and whether a need for similar views from dissimilar communities would be required.
- Scenarios wherein recommender would be used.

Table 30 provides an example highlighting the requirements of all of WP3's core systems in the GAM Case Study.

User Modeler	Characteristics of a user.	Age (range 5 years), gender, profession, interests, education level, special needs, social networks (interests), motivation for a visit, login with different technological devices.
	Types of groups a user engages with.	Students, educators, retired people, general public.

	Characteristics of a user derived from the group visiting with.	For the deaf users: familiarity with Italian Sign Language For educators: high education level and teaching for motivation; For general public: cultural enrichment and curiosity.
	Interactions between a user and the Case Study's software application's front-end systems.	Curator selecting a collection, annotating and commenting, creating stories by selecting items for stories, and sharing as well as "liking" stories.
	Properties of a user that can be derived from a user's interactions with the Case Study's software application's front-end systems.	Preference for themes, artwork types and categories (periods, artists, etc.) from selection, inclination to create stories, and inclination to accept recommendations.
Semantic Annotator	Textual input provided by a user that is of interest to the Case Study.	Biographic topics remind a user of geographical and historical events, and art movements.
	Whether a Case Study is interested in sentiments or emotions or both.	Both
	A list of synonyms in the native language that the Case Study is interested in.	Yet to be compiled and will be sent separately to WP3.
Community Modeler	Explicit groups in the Case Study.	Deaf community that includes several types of hearing impairments, educators such as museum educators and special educators, and relatives and acquaintances of the deaf.
	Possible implicit groups in the Case Study.	Groups of interest for themes, artwork types and categories (periods, artists, etc.), and groups based on sentiment and emotions.
	Data collected that could support classification in an implicit group.	Selected artworks, text annotations (topic, memories, affect, tags), emotions, "liked" stories.
	Groups that are of interest to the Case Study.	Teenagers (as orthogonal to def/ non deaf)
Social Recommender	Purpose for which recommendation may be required.	Provoke (recommendations based on diversity), encourage (recommendations based on similarity), inclusion (high-level purpose, common to all user activities), empathize (for recommendation of other people's stories).
	Recommendations of the types of user generated content that are of interest to the Case Study.	Recommendation of stories
	Whether explanations of the recommendations would be helpful.	Yes
	Whether a digital nudge for the recommendation would be helpful.	Probably yes
	Source of the diverse views, whether they would be from groups that are similar to the user demographically (explicit communities) or from citizens that have similar interactions (interests, emotions) and whether a	Similar interactions and dissimilar views from similar communities (in group and between group differences)

	need for similar views from dissimilar communities would be required.	
	Scenarios wherein recommender would be used.	We would like to promote diversity but without exposing the characteristics of fragile groups.

Table 30: An example of requirements from the WP3 core systems in the GAM Case Study.

For a more detailed explanation of the requirements within WP3's core systems from the other Case Studies, please see the deliverables: D3.3 – Final user and community modelling, D3.4 – Final semantic annotator, D3.5 – Prototype clustering techniques, and D3.6 – Prototype community recommender.

WP4 – Linked Data Hub

As stated by WP4 in D4.2 – Linked Data server technology, integrating feedback from use case requirements, the SPICE Linked Data Hub (LDH) "was developed as a data infrastructure to support the acquisition and management of dynamic data from a variety of sources including: museum collection metadata and digital assets, social media events and user activities, systems' activities (e.g., recommendations, reasoning outputs), ontologies and linked data produced by pilot case studies".

The pilots are described from the point of view of the LDH interaction based on its:

1. Requirements: Data management needs.
2. Application workflow: An end-to-end pipeline clarifying the role of the LD infrastructure.
3. Feedback: Aspects that worked and those that could be improved.

An example of MNCN's Treasure Hunt pilot from the point of view of LDH interaction is provided below:

1. Requirements:

- LDH needs to store a User ID alongside its associated user information without keeping sensitive details such as passwords.
- Maintaining a collection of Treasure Hunt (pilot application) definitions over the museum artefacts with each containing a set of basic properties such as description, target audience, title, tags, and a sequence of phases to be executed within Unity3D (platform on which the application is being developed and running).
- Each phase adheres to a specific format such as multiple-choice questions, object search, multiple information, and more.
- A dedicated LDH would store and maintain data about artefacts that are a part of the pilot application.
- User responses and interactions with each activity in a pilot application such as time and date, unique session id, device, and associated group will be persisted in collections of interaction events.

2. Application workflow:

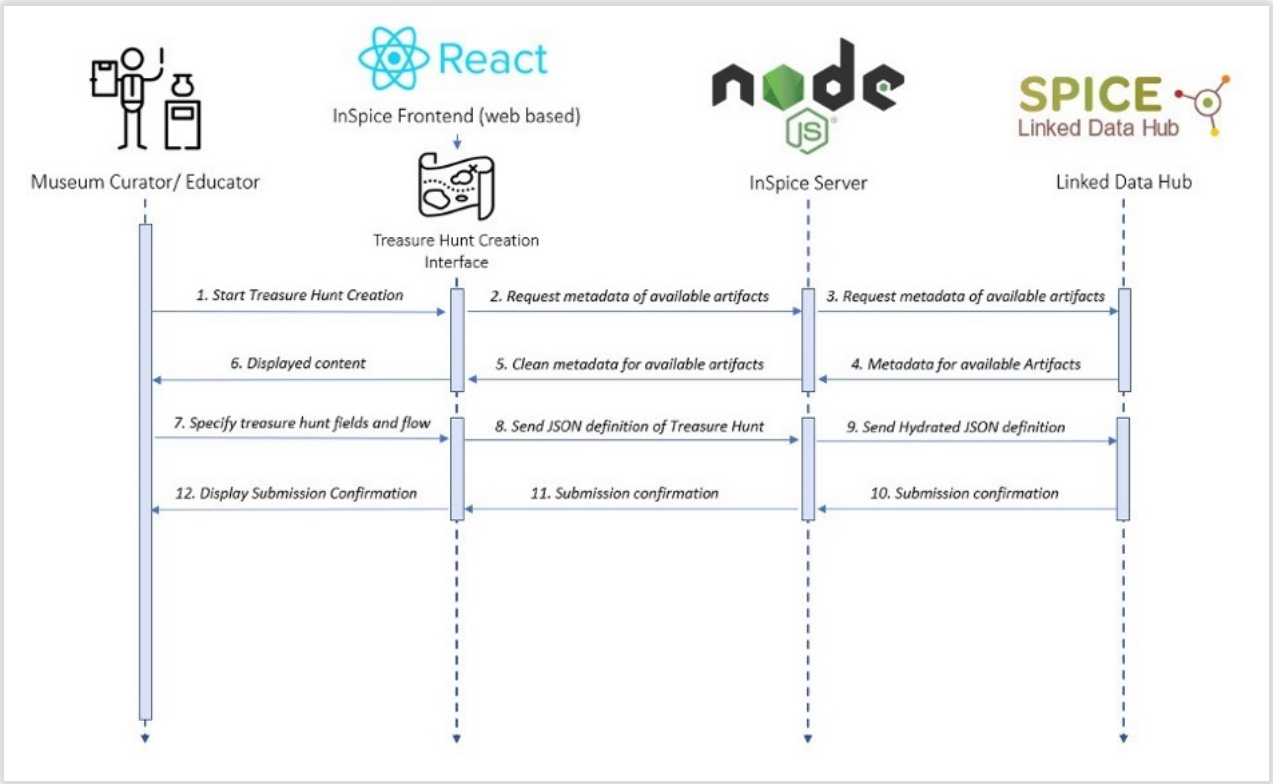

Fig. 33: Schematic representation of the Treasure Hunt Creation "Flow" for educators or museum creators (for more detail, please visit D4.2 Fig. 4.6.3.1).

An educator or museum creator logs in and performs the following actions stated in Fig.33 to create a Treasure Hunt activity for MNCN. For a detailed explanation of the workings of the front-end and back-end services that integrate with the Linked Data infrastructure, please refer to D4.2 – Linked Data server technology, integrating feedback from use case requirements.

3. Feedback:

- MNCN would require manual introduction of new data objects or definitions within a given collection into the LDH (artefacts, tests treasure hunts definitions, etc.) as well as browsing of such objects.
- MNCN artefacts often have an association with multimedia content such as images, videos, and audio files and maximal use of this functionality would be welcome within the LDH.

To understand all the other Case Study pilots in terms of LDH interaction, please visit D4.2 – Linked Data server technology, integrating feedback from use case requirements.

WP5 – Citizen curation activities for interface development

WP5 provides prototype interfaces for citizen curation in D5.2 – Prototype interfaces for interpretation and reflection. The initial implementation of citizen curation interfaces in the Case Studies is provided in the document organized via a framework of reusable interface components known as "inSPICE". From the individual use case prototypes in the pilots of the Case Studies, interface components have been identified and commonalities have been established so as to integrate these into a common framework for implementation. D5.2 – Prototype interfaces for

interpretation and reflection describes the software architecture, general purpose components, and citizen curation templates.

The prominent interface use cases for the Case Studies in the inSPICE framework include:

- Treasure Hunt Authoring (MNCN): creation and consumption interfaces
- Viewpoints Authoring (IMMA): for Slow-looking activities
- GAMgame Authoring (GAM): creation and consumption interfaces
- Multistage form creation (HECHT)
- Collection browsers (DMH, GAM, HECHT, IMMA, MNCN)

In addition, D5.2 – Prototype interfaces for interpretation and reflection also describes interface components with general usage such as artwork selection and forms as well specific usage to the Case Studies.

WP6 – Ontology and reasoning systems

WP6's D6.5 – Final ontology network specification provides the final version of the SPICE Ontology Network (SON) and their main objective is providing "the ontological backbone for the representation of citizen curation". As stated in D6.5 – Final ontology network specification, SON enables "software components to organise, exchange, query, interpret and reason over data collected or generated during the citizen curation activities". There are several areas covered under SON prior to the adoption of the ontology network in the Case Studies and these include:

- User and Community Knowledge Area
- Emotion Knowledge Area
- Ontologies for supporting reasoning services

Please visit D6.5 – Final ontology network specification for an extensive description of these areas.

WP7 – Co-design and progress with the STS map and the PM Tool

Building on an initial theoretical framework of the Socio-technical systems (STS) map in D7.2 – Socio-technical Roadmap with Project Management Tool, the latest version demonstrating how the Case Studies make use of SPICE systems in different ways to implement strategies addressing their end-user communities and heritage institutions is available in D7.4 – Socio-technical Roadmap with Project Management Tool. The STS map serves as a visualization tool aiming to promote transparency by touching upon interpretation, reflection, and sharing and showcasing how they are implemented as a part of an AI hybrid human-machine interaction system (p.11). The Case Studies are addressing key issues regarding accessibility and inclusiveness with their end-user communities, and these are defined in the STS map. The elements in the SPICE STS map include: 1. Plane, 2. Nodes, 3. Lines, 4. Labels, 5. Legend 6. Symbols, 7. Title and subtitle (pp. 13–15)

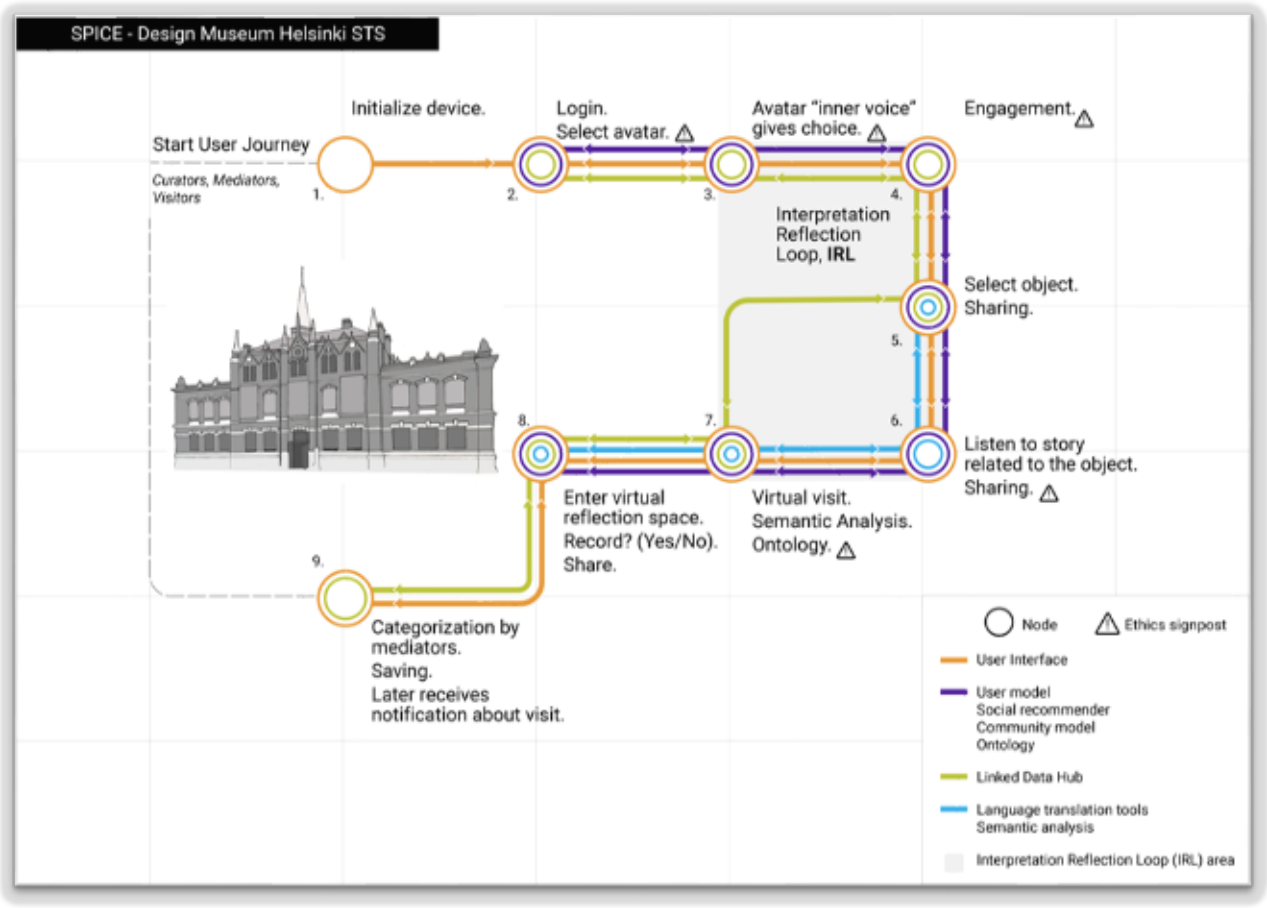

Fig. 34: An example of the STS map of DMH wherein the interaction system features VR, multimodal experience involving interaction through avatars with 3D digital replicas of the collection, see D7.4 – Socio-technical Roadmap with Project Management Tool.)

The STS maps of the other Case Studies can be seen in D7.4 – Socio-technical Roadmap with Project Management Tool.

The PM Tool in SPICE is intended to make work across the WPs and Case Studies seamless through the creation of project activities and live visualization of developments. The organization of the PM Tool and benefits is described in D7.2 – Socio-technical Roadmap with Project Management Tool (p.44). Planner boards in the PM Tool are categorized by 4-month time periods for WPs and Case Studies. An example of a time period between Jan-April 2022 showcasing the activities and tasks carried out by IMMA is represented in Fig. 35 below and the boards of other Case Studies can be seen in D7.4 – Socio-technical Roadmap with Project Management Tool.

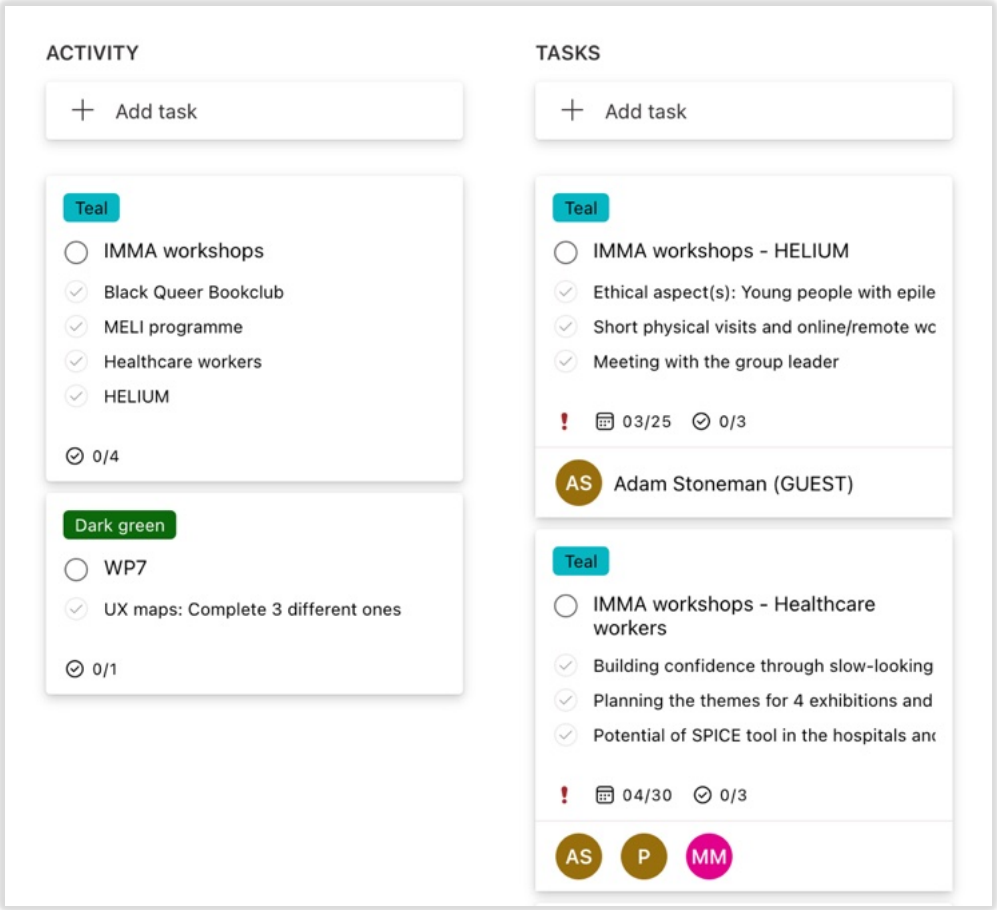

Fig. 35: An example of IMMA's board showcasing the *Activities* and *Tasks* taking place during the 4-month period between January to April. The boards of all the Case Studies and WPs are available to the members of the consortium in the SPICE SharePoint directory.

5 – DISCUSSION AND CONCLUSIONS

Not only does a UX map provide an estimation and analysis of a user's experience through the context of emotions and behavior, but it could also be an effective tool for Case Study members to communicate their project or pilot to other museum stakeholders. An interesting example of this is Szabo's (2017) description of a "4D User Experience Map" as a mechanism for mapping and communicating it clearly. Through the example shown in Fig. 36, the horizontal dimension is mapped as the milestones which is quite similar to the phases in Fig. 36's experience map example of pregnancy. Similarly, the vertical dimensions are mapped as events. In addition, Szabo uses the line thickness to mark importance, colors for severity, and a rating system to define motivation, ability, and a "fun factor". This is perhaps an excellent way to create a map as well as communicate the gist or essence of a Case Study to other stakeholders involved with the museum.

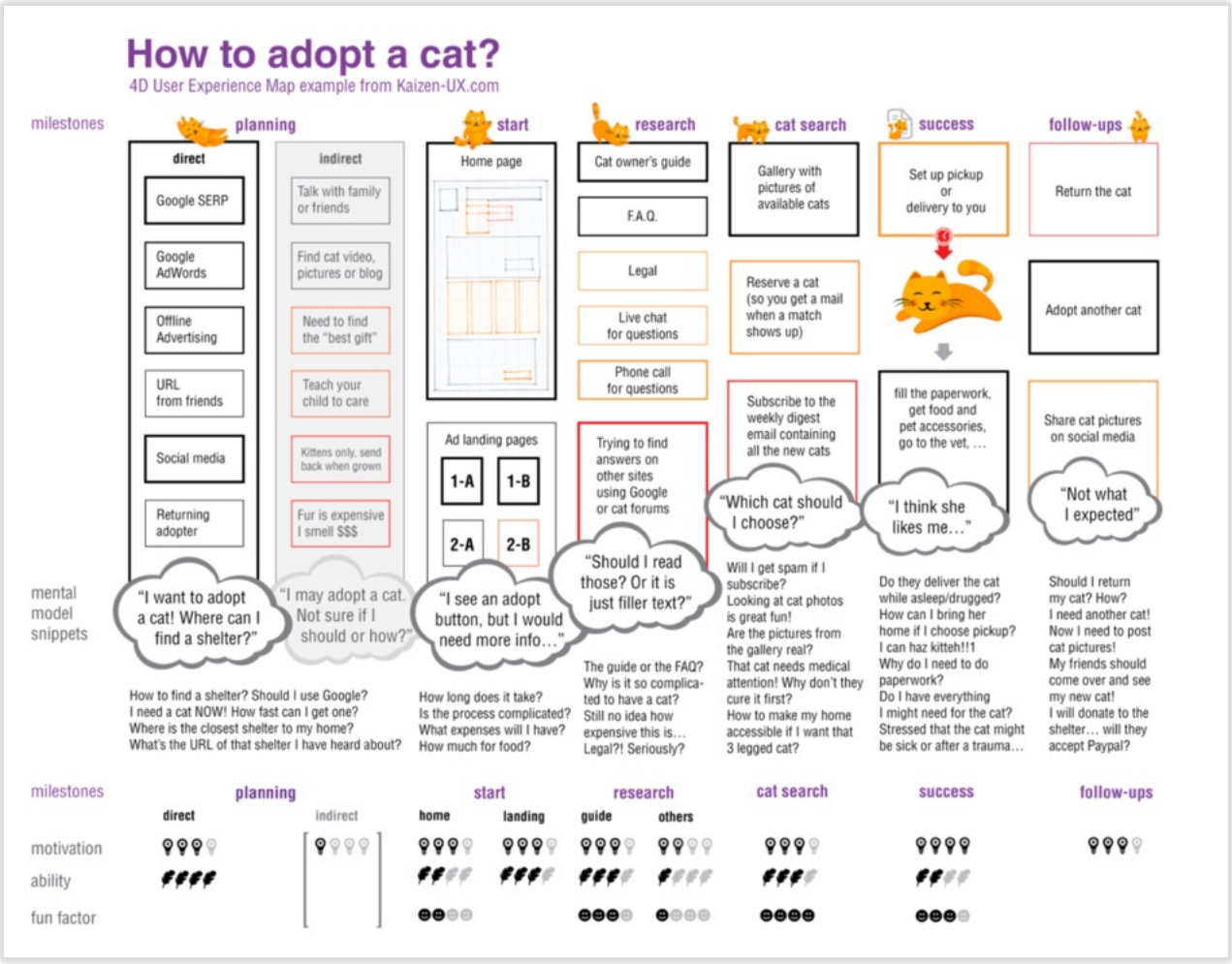

Fig. 36: An example of a "4D User Experience Map" (Szabo, 2014).

Overall, this deliverable report highlighted the importance and implementation of co-design methodologies across the Case Studies such as persona design and user-experience mapping. Over the past year, each Case Study Museum has progressed considerably with their pilot applications, workshops and activities, as well as the cultural and technical infrastructures. In addition, the Case

Study Museums have also conceived specific plans for future workshops and activities until they are fully operationalized.

As was mentioned in D7.3 – Case Studies Progress and Plan, a paradigmatic shift has taken place in the past couple of decades wherein a museum's visitor's well-being is increasingly understood as paramount (p.33 cited from Kirchberg & Tröndle, 2012). In SPICE, this is evaluated through user-experience, accessibility, inclusivity, and several ethical dimensions. Through several pre-workshops conducted over the past year with senior citizens, Design Museum Helsinki has created a framework for the *Pop-up VR Museum* that enables its visitors to engage with and contribute stories about the museum's artefacts. Similarly, Galleria D'arte Moderna's GAMgame as a web application allows the Deaf community and other museum visitors to interpret the museum's collection using their own emotions. In the HECHT Case Study, school students have been sharing their own perspectives on historical dilemmas and curating "virtual exhibitions". Through the Deep Viewpoints web application, the Irish Museum of Modern Arts has critically engaged with underrepresented communities such as migrant groups, *Black & Irish* organization, LGBTQ+ groups, healthcare workers, asylum seekers, young people in detention and young people living with life-long illnesses. During the Madrid Science Week held early November 2021, Museo Nacional de Ciencias tested out their Treasure Hunt application that provided school students with a gamified visit to the Science Museum and they reflected on it via opinions about climate change. Overall, not only do we see that the Case Studies provide an opportunity, but a manifestation as well in grounding the research and development process within the context of real-life situations.

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