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SPICE

Social cohesion, Participation, and Inclusion through Cultural Engagement

D7.4 SOCIO-TECHNICAL ROADMAP WITH PROJECT MANAGEMENT TOOL

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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 deliverable document includes a design and implementation of a Socio-technical system (STS) map of the SPICE Case Studies that visualizes the integrated technical components of the SPICE system with representative end-user activities. The map is built on the theoretical framework of a distributed co-design ecosystem and grounded in the previous WP7 deliverable of the Socio-technical roadmap, D7.2. A network diagram representation is used to map the user's trajectory through the system. The main components of this information graphic consist of a 2D plane, and a series of nodes and lines that bring the user into relationship with the system's elements in time and are also used to depict a typical journey throughout each of the Case Studies. A legend, labels, symbols and title further amplify and qualify the meaning and experience of interaction with the SPICE system components. Even though the trajectory of the routes is the same, the mapped interactions indicate how the user experience is different for each of the cases. Ethical points requiring further consideration through the journey are highlighted to note the need for further reflection. Lastly, the Project Management (PM) tool is used to further divide the points in the maps into a detailed set of activities and tasks co-designed by several partners in SPICE.

Document History

Version	Release date	Summary of changes	Author(s) -Institution
V0.1	31/03/2022	First draft released	Aalto, DMH
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V1.0	25/04/2022	Final version	Aalto, DMH, AAU, OU

List of abbreviations and terms

AI – Artificial Intelligence

CAIDA – Centre for Applied Internet Data Analysis

DMH – Design Museum Helsinki

GAM – Galeria d'Arte Moderna

ICT – Information Communications Technologies

IMMA – Irish Museum of Modern Arts

IoT – Internet of Things

IRL – Interpretation Reflection Loop

LDH – Linked Data Hub

MNCN – Museo Nacional de Ciencias Naturales

PM Tool – Project Management Tool

STS – Socio-technical system

VCD – Visual Communication Design

WP – Work Package

UX – User Experience

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1 – INTRODUCTION

The objective of this deliverable is to design and implement a SPICE Socio-Technical System (STS) Map. The process of developing such a map has required the creation of a representation to visualize the different technical components of the SPICE system while at the same time depicting the different activities carried out in each of the Cases when using the SPICE system. Though the term 'mapping' has an abundant presence in the STS literature, an image search for a representation format that would allow us to tell the story of the SPICE project while at the same time providing the affordances needed to monitor the aspects of the work mentioned did not yield commensurate results with the meaning of the term 'map', a descriptor that until recently was reserved for objects that carry iconic information of geographic data.

In order to develop the current representation of the map, we have combined knowledge gathered from interaction design and visual communication design (VCD) literature. In the case of VCD, we have used a monosemic approach whereby information is represented using graphic signs whose meaning has been defined beforehand. These signs (or marks) are gathered together into a structure that enables reading and decoding information, into a narrative that enables comparison and questioning. The structure of the design is inspired by Henry C. Beck's *London Underground Tube Map*. In this landmark design Beck simplified the display through the use of an integrated circuit metaphor in which lines stand for journey routes and nodes[1] stand for destinations along the tracks. He also erased all geographical elements except one: A simplified graphic representation of the river Thames bearing semblance to the real thing served as reminder of the identity of the place, namely London.

Beck's design focused on the *situation of use* as primarily concerned with identifying the journey's point of departure and destination, without much concern for other details along the way. Similarly, it could be argued that in the case of contemporary infonauts,[2] once the intention (or goal) that informs the interaction has been identified, it should be the task of the system to facilitate the realization of the journey for the interactant. As Tsvi Kuflik has stated: "...AI and HCI user modeling and personalization are a key issue here, reasoning about users understanding..." [and] "...predicting what users may be interested in is the main focus here."[3]

The activity of mapping online spaces is a practice that has continued to develop as computer information systems and their applications have expanded in scope, size, and complexity. Already in the year 1997, projects such as CAIDA[4] and publications such as Martin Dodge and Rob Kitchins' *Mapping Cyberspace* (2001) were carrying out landmark attempts to create proper mappings of the spaces that emerge from the convergence of human interaction with communications information technologies.

[1] In certain versions of the map tick marks are used alongside nodes to indicate stations.
[2] Infonaut, cybersurfer (plural cybersurfers) A person who browses the Internet, Wikitionary, https://en.wiktionary.org/wiki/cybersurfer#English, Accessed 24/04/2022
[3] Diaz-Kommonen, L., Vishwanath, G. Ethnographic interview with Tsvi Kuflik conducted on 13 October 2020.
[4] CAIDA – Center for Applied Internet Data Analysis, https://www.caida.org/about/, (Accessed 5/04/2022).

Each of the Case Studies makes use of the SPICE System in different ways to implement strategies that address issues of importance to their target communities and heritage institutions. In our work developing the STS map of the SPICE system, we have used the human-centered scenarios developed earlier in the project to identify the situation of use and describe the behavior of the people engaged with the heritage artefacts and the software tools through the Case Studies. Additionally, we have used the user journey scripts developed in WP2 (see D2.3 – Revised Methods of Interpretation) and the persona-oriented UX journey scripts (see D7.5 – Case Studies Progress and Plan) created in WP7 to derive the interaction sequences employed by each of the Case Studies.

Given the differences we also have held joint sessions with the Cases Studies and the technical work leaders to discuss and check that the interaction sequence depicted in each of the Case Study versions of the map are accurate. These consultation sessions will continue during the next year of the project when the map is implemented throughout the Case Studies to provide a structure for guiding the interaction design as well for checking accountability regarding ethical issues related to safety and security, including privacy, freedom from bias, and informed consent.

2 – SUMMARY OF PREVIOUS SOCIO-TECHNICAL ROADMAP (D7.2)

We concluded the earlier report on the state of socio-technical (STS) studies developments during the second decade of the 21st century by commenting on the radically different situation of the field, in comparison to its beginning during the early post-war years. Today, in the Era of the Information Society, the relentless push towards convergence of Information Communications Technologies (ICT) with Internet of Things (IoT) continues and so that information processing artefacts increasingly pervade the social fabric of all human activity from work to learning, to leisure and entertainment.

In this first report, a timeline representation of the STS Roadmap requiring development and implementation was provided. Here we stated how one of the pre-requisites for the map to be created was that it should enable periodical examination of the project timelines for all the case studies as well as coincide with the use of the Project Management (PM) Tool. According to the specifications mentioned in the earlier document, the SPICE STS Map should also provide insights regarding interaction between the social and technical realms. Among the questions to be answered would be: Where and why do these elements form entanglements with one another? Are there obstacles which prevent the workflow? Why are these formed and how can these be prevented? What ethical issues come to the foreground as information technology artefacts touch the surface of the human domains? These are some of the questions that we hope will emerge from the use of the SPICE STS MAP.

The STS Map design presented in this deliverable has been created considering each of the Case Studies. It has the following aims: 1. Map the interaction of each of the stakeholder communities with the SPICE system, for each of the Case Studies; 2. Enable comparison between the Case Studies so that we may better understand how the major research objectives of the project are realized; 3. Reveal as much as possible where the goals of promoting accessibility and inclusiveness might confront unexpected glitches in the form of ethical issues. Finally, the map ought to work as a tool that allows self-assessment by each of the Case Studies to be? carried out by and incorporated as brief reports every six months, during the final year of the project, in October 2022 and April 2023.

Based on the work done during the second year, we have designed a sequential “journey-oriented” structure that can be viewed from different levels, beginning with a general perspective that is concept-based and focuses on the property of *things*, including the software component and their attributes depicted as route lines. These are rendered in different colors and aim to show the relationship (connections) of the interactant with the system through her (or his) journey. In addition to describing the system from this general perspective, we have also made abstractions of different levels where prototypical explorations through networks of possible interaction are depicted. An example of this can be seen when one compares a Case Study with another. For example, in the initial interaction with the Design Museum Helsinki Case Study, Login is followed by the possibility to select an Avatar for self-representation to be used during the online VR session that follows. It is expected that basic demographic data gathered at this point will result in a

selective display of 3D objects. Here the user will be asked to make a selection from the artefacts presented. Once the choice is made, the user will hear the object 'tell' a story. It is envisioned that this interaction will trigger instances of the Interpretation and Reflection Loop (IRL) whereby the interactant decides that she (or he) will share her (or his) stories in relation to the objects selected.

In the Irish Museum of Modern Art Case Study, the Deep Viewpoints app (that is part of the User Interface for this Case Study) gives the user a Login. It is expected that user demographics gathered at this point will associate the user with a community group who is participating in the gallery visit. This is followed by a tutorial that includes a tour of the gallery in which Slow Looking activity is described using only the artworks and *without interaction with the system*. This particular attribute of the way the IMMA Case uses the system is expressed visually through the use of a broken line pattern between nodes 3 and 4. After the tour, the group gathers again to engage in reflection. They enter the IRL by further interaction with the themes and topics displayed in the Viewpoints app. Here they can also read and compare their thoughts with the reflections of others who have already entered theirs into the system. Furthermore, when they decide to do so, they can also share their interpretations by entering into the system.

Finally, there is a more profound level in which visualizations, while tapping into deeper metaphors based on how we perceive the world, also serve to provide scaffoldings for abstract concepts. Thus, the lines that bring together all the nodes also stand for connections that emerge between different types of data through the system's components. The grey area labeled as **Interpretation-Reflection Loop (IRL)** then could be said to present a poetic confluence of performativity and narrative whether it is on line or on site, with one individual interactant or with groups engaged and focused on the artefacts on display in the gallery.

3 – FRAMEWORK OF THE SOCIO-TECHNICAL ROADMAPS

3.1 Objectives

The SPICE STS Map seeks to illustrate the interaction with SPICE system – in space and time – within the settings of five Case Studies located in different heritage institutions. As a visualization tool, it aims to promote transparency by displaying different concepts developed as part of a system which touches on deep human communication activities such as **Reflection**, **Interpretation** and **Sharing**, and how these are being implemented as part of an AI hybrid human-machine interaction system.

Furthermore, though as a cohesive system, the features of the SPICE system are similar, the spatial interaction of the end-user communities with the system components as well as heritage objects varies according to the Case Studies. For one, the notion of accessibility has been defined differently by each Case. For example, whereas in the Case Study of the Galleria d'Arte Moderna, GAM, lack of accessibility might occur in relation to a physical challenge that impacts linguistic communication, in the Case Study of Design Museum Helsinki the challenge to accessibility is seen as a physical gap resulting from a lack of physical mobility.

From group-oriented sessions in physical spaces such as a school setting or the museum gallery to individual online virtual reality journeys each Case differs. Additionally, though the Cases all address key issues regarding narrowing (even bridging) inclusiveness-gaps and entry point roadblocks in relation to access to heritage and knowledge, their work is carried on with different types of end-user communities.

In the map we also seek to illustrate how relationships between the different ideas that are part of processes become embedded into a material artefact. For though we might understand how information communication technology (ICT) systems are of a different order from the human, there still exists a co-creative relationship between us and these artefacts: As we bring them into being – using research, design, and development methods – these external representations become inserted into our everyday existence so that they come to shape our culture and our ways of living. As Ware has noted, visualizations act as memory extenders that enable cognitive operations and problem solving that might otherwise not be possible. This in turn calls for observation and analyses regarding the role and impact of these technologies. This latter is a process that should intensify during the last year of the project, when the different end user communities will have the opportunity to fully interact with the system.

3.2 Design and development

SPICE STS map portrays the system's co-design and implementation through a series of Case Studies in the following heritage institutions: Design Museum Helsinki in Finland (**DMH**); Galeria d'Arte

Moderna in Turin (**GAM**), Italy; **Hecht** Museum in Haifa, Israel; Irish Museum of Modern Art in Ireland (**IMMA**) and Museo Nacional de Ciencias Naturales in Madrid, Spain (**MNCN**). A common structure in the form of a *network diagram* is used to plot the space of interaction as well as stages of user engagement throughout the user experience journey.

A network is a schematic design or diagram with zero degree of iconicity used to depict a set of relationships. A network contains a set of objects and a mapping, or description of relations between the objects.

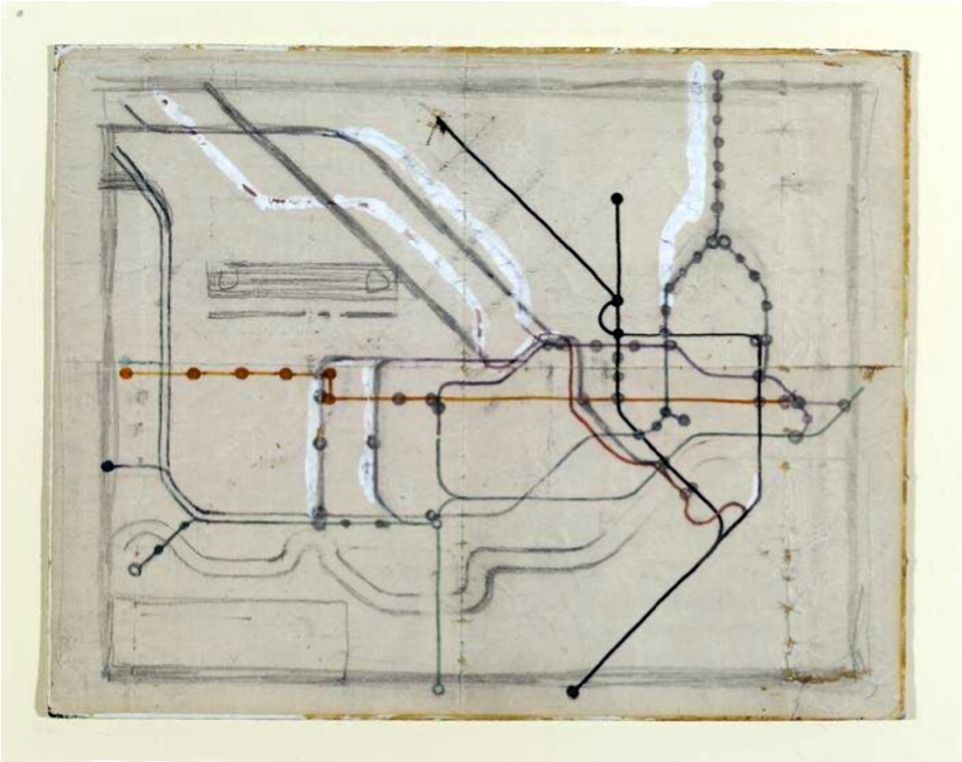

***Figure 1**: Original sketch of the London Underground Railways Map by Henry Beck, 1931. The item is part of the Victoria and Albert Museum Collections online.*

Network diagrams are typically used to show how things are interconnected. The term can be extended to include representations designed for showing how things, people and events can be interrelated (Harris, 247). Examples of the use of these representations, 1. include illustrations showing interconnectedness of routes in a subway system (See Figure 1 for an early hand-drawn sketch of the now classic design of the London Underground Railways Map); 2. graphic designs that show how hardware and software components are connected together to carry out a particular purpose (GÉANT – pan-European data network for research and education)[5] or 3. to depict different stages of activities in a project (PERT charts are one example of this type of network diagram). Our design is a new contribution in its use of the combination of lines and nodes to represent ICT systems components and interaction events as vehicle that supports a user experience journey.

[5] GÈANT Network, https://network.geant.org, Accessed 21/04/2022

3.3 System components

3.4 Visualization

Among the goals in creating the Socio-Technical System map was to reveal a common interaction structure that allows us to follow the user engagement with the SPICE system. In this way, we might be in a better position to discern the differences and similarities between all the Cases and the system's response to them. The map also aims to make visible the ideas and concepts being developed in SPICE as seen from the perspective of different *levels of interaction* present throughout the course of user engagement with the system. These are complex tasks involving many aspects including how: 1. Interaction with SPICE system comprises diverse human activities, processes and tasks taking place in different spaces and contexts, including a gallery or a museum, an educational setting such as a classroom or even a virtual reality online space. Additionally, interaction is meant to be carried out within heterogeneous communities with accessibility and inclusiveness as main goals. 2. SPICE system is a hybrid system that makes use of artificial intelligence (AI) and machine learning technologies including supervised, unsupervised learning, clustering, and structured prediction (output). These technologies are part of what is often referred to as the Back End system components and as such they are not readily apparent to the user when engaging with Front End components such as the user interface on a mobile device, such as an iPhone or a tablet. Nevertheless, given its *transactional nature* it is of paramount importance that those involved in creating the system (e.g. designers, engineers, museum curators and scholars) become aware of the effects that the use of these technologies might have in the publica arena.

3.5 Map Components

The map components can be divided into internal and external components. Internal components are those used when representing the content (key information) to be communicated (Bertin). Examples of the internal components of the SPICE STS map include the Nodes and Lines. As connectors, the Nodes also indicate points in time where user interaction intersects with the different features of the SPICE Systems components represented by the Lines. External components, such as the Legend in the map refer to those visual elements and are used to amplify and further explain the meaning of the internal components for the viewer. Overall, elements in the SPICE STS map include: 1. Plane, 2. Nodes, 3. Lines, 4. Labels, 5. Legend 6. Symbols, 7. Title and subtitle.

3.5.1 The plane

The map is represented using 2D planar surface (area) marked by a 7 X 7 reticule across the horizontal and vertical directions. The reticule divides the space into a homogeneous area in which the elements of the map are depicted. Though measurable, the plane itself bears no meaning. The rectilinear arrangement is sequential and comprising all the graphic elements needed to convey the message.

3.5.2 The node

A node in the map indicates a *placeholder*, a contact zone, and an entity in time where the user, who is involved in performing a task, comes into engagement (directly or indirectly) with one or more of the SPICE system components. These sites of connection afford *correlation of events* in the

interaction sequence and feature *concurrence* (*convergence*) of different types of data from various sources, or components in the system.

3.5.3 The lines

Together the lines are used to indicate the vehicle that enables the user's journey as she or he undertakes interaction with the system. The lines have two attributes: Color and pattern. The color attribute is used to indicate the component's identity. The pattern attribute can be used to indicate system state. Though by default, once initialized, all system's components are active. in certain circumstances, a pattern – such as a broken line – can be used to denote that the system is not in use. An example of this is when a group decides to momentarily lay aside the digital tools and engage directly with the contents in the gallery. Which front and back-end system's components are being deployed and when? What networks of connections (e.g. what queries are accessed, what data is written and saved, when the user completes the demographics entries in a user model? How does this action link the user with other components in the system as well as others outside of it?

On their own, each line represents key elements in the system. The orange line for example, indicates components that are part of the user Interface. These are primarily front-end tools that take user input returning outputs. The green line represents the Linked Data Hub, which as an active, dynamic catalog follows the user interaction from the beginning to the end. The purple line denotes the elements of the system concerned with contextualization and representation of the interactants. This includes the user model, the community model, the recommender model as well as DEGARI an emotion-oriented instrument involved in reasoning about the user responses. The blue line indicates language translation and semantic analysis tools. Arrows are used to indicate whether information flow throughout the interaction is oriented in one direction or two. The length of the lines is the same throughout the map and has no meaning.

3.5.4 The labels

The labels include textual elements used to display two types of data: 1. Nominal data that is descriptive of user interaction events such as for example "Login", or "Select Avatar", and 2. Ordinal data associated with the nodes and used to describe the sequence of events in the user journey. For example, in the Pop-Up VR Museum – Design Museum Helsinki Case, after Login and selecting an Avatar, in Node 3 the interactant is presented with 3D replicas of design heritage artefacts that when approached 'speak' with inner voices.

3.5.5 The legend

A legend is used to further explain all the elements and their attributes in the map. For example, the colors of the lines further designate the systems components into four main groups: **Orange** is used to indicate the user interface; **green** represents the Linked Data Hub; **blue** represents the language translation and semantic analysis tools, and **purple** indicates the suite of tools associated with the user model, recommender system, community model and system ontology. The legend also includes the explanation for symbols utilized in the map: The **node** as placeholder which the denotes the user interaction at a specific point in time, the **ethics signpost,** and the grey area to indicate boundary parameters for the **Interpretation-Reflection Loop (IRL)**.

3.5.6 The symbols

The symbols used in the project are signposts meant to call attention to special points in the journey. At the moment there is only one symbol in the map: A triangle with an exclamation point is used to call attention to the possible existence of ethical issues. As the map is used by the Cases throughout the third year of the project, it is expected that commentaries regarding these important issues will be recorded in these key points.

3.5.7 The title

The function of the title is to indicate to the viewer the way in which the graphics in the Map should be read and interpreted. Even though an external element[6], the name of a graphic operates as a linguistic memory form, evoking and linking places, events, and people. The name of a graphic can also act as a magnifying glass, placing emphasis on certain aspects of an event or experience, while ignoring others.

6 6. Bertin proposed that as external elements independent of the graphic image itself, titles, subtitle and the legend serve the function of properly identifying the domain of knowledge treated by the information representation.

4 – THE SPICE CASE STUDIES STS MAPS

In the following section we present the overall structural pattern of the map and how it is being used for mapping the different activities and tasks in the five Case Studies developed in the project.

4.1 Pop-Up VR Museum – Design Museum Helsinki, Finland

The Case Study in Finland is being carried out by Design Museum Helsinki and Aalto University, Department of Art and Media. It features the design and implementation of a Pop-Up VR Museum that will bridge the physical accessibility gap. It is expected that the VR Museum will visit different facilities and places throughout Finland.

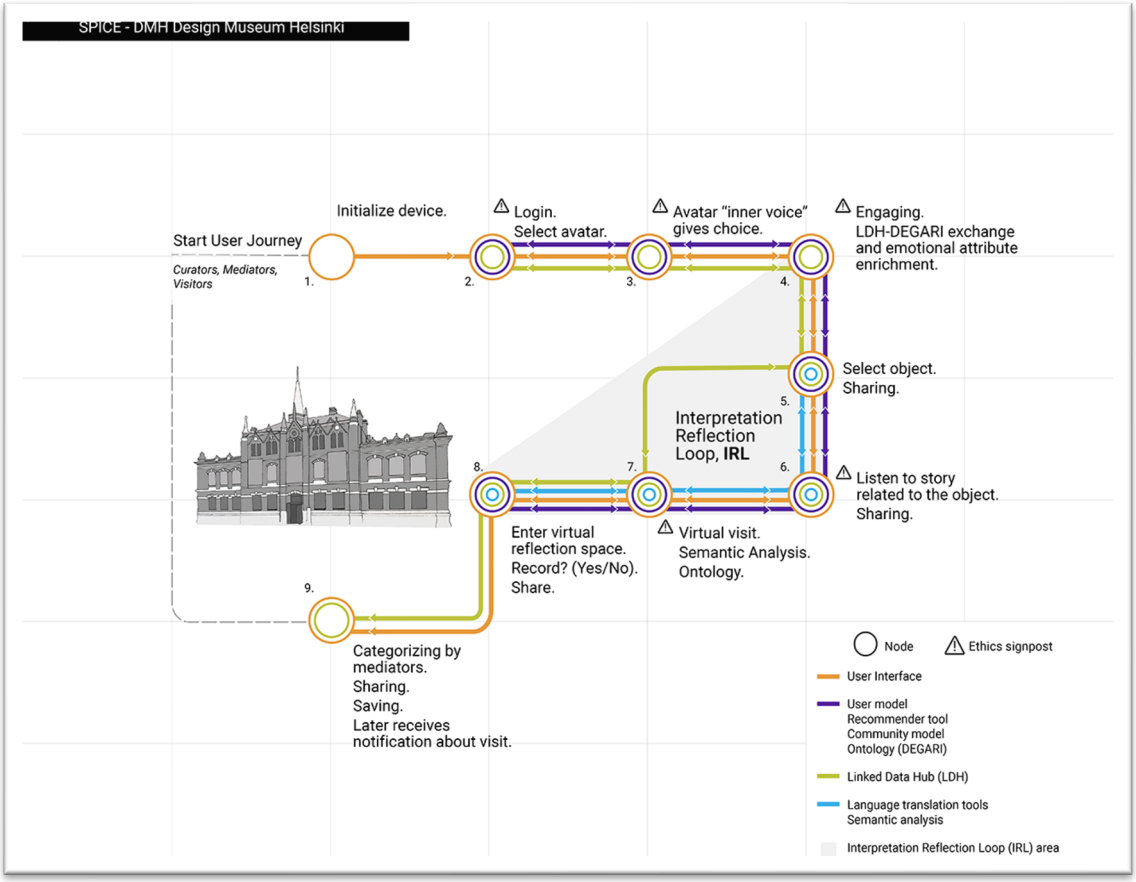

Figure 2: Design Museum Helsinki's interaction with the system features a virtual reality, multimodal experience involving interaction through avatars with 3D digital replicas of the collection.

During the past year, the Museum has been carrying on a series of co-design workshops with user communities comprising Senior Citizens. The specially designed workshops conducted by museum educators are based on the methods of artifact analysis, autoethnography and duo-ethnography (see D2.3 – Revised Methods of Interpretation). In onsite and online workshops based on group discussions, stories, comments, and interpretations about design objects have been collected in the form of audio recordings, written texts and annotations and drawings.

This group of narratives by individual participants will form the basis of data in the Pop-Up-VR-Museum. The stories will trigger more stories and new personal reflections, and in the course of time, the objects from the DMH collection will get populated with a multitude of stories by citizens.

The data collected in workshops consists of a rich variety of interpretations from few word statements to lengthy personal recollections and even art works in form of poems or odes or paintings. There are individual memories about using the objects or encountering them during earlier years. In the narrations objects are linked to people, places, and time, and as a whole the stories deal with meaning of design in individual life stories.

The Case Study is also working on implementing an online version of a Pop-Up VR Museum using virtual reality. This virtual space will enable the museum to travel, making their collections accessible to different stakeholder user groups, including senior citizens, rural dwellers, and asylum seekers.

4.2 The GAM Game – Galleria d'Arte Moderna, Turin, Italy

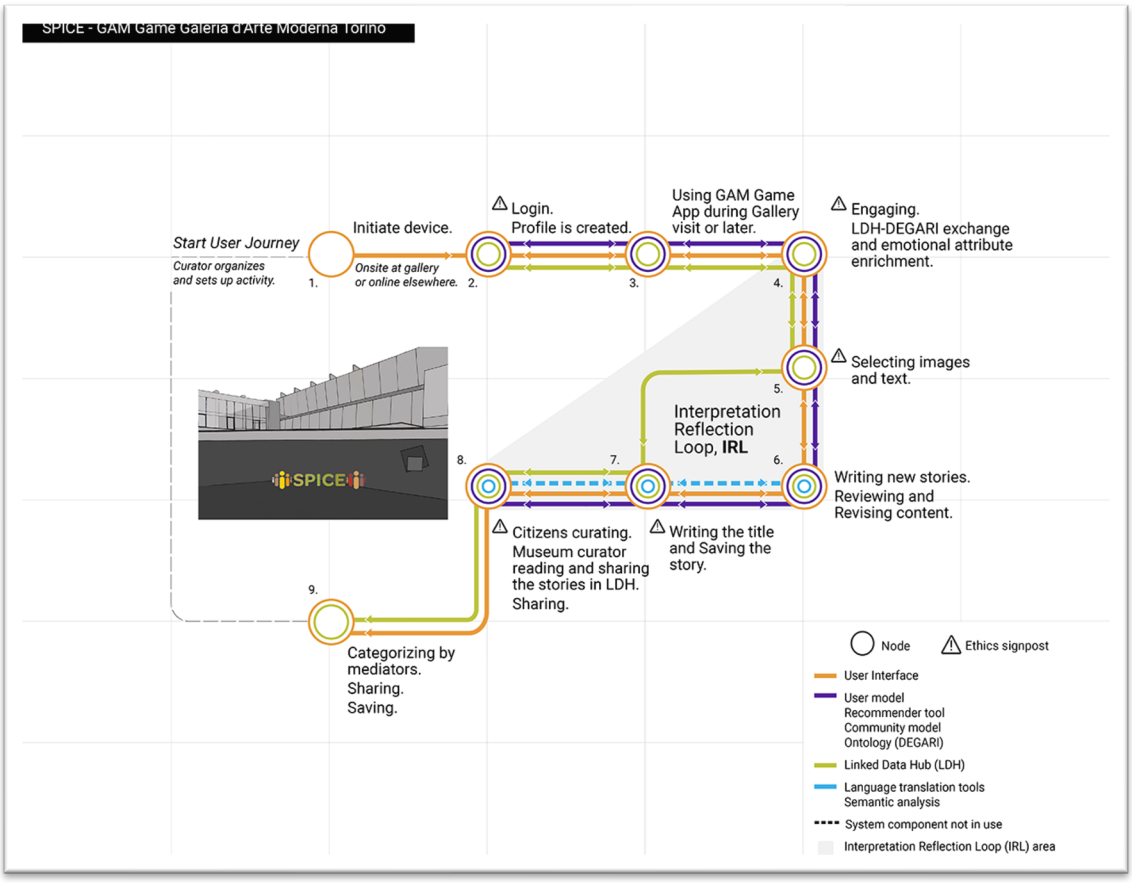

Figure 3: Galleria d'Arte Moderna's uses a mobile game application to enable online and onsite visitors to reflect, create and share stories about their emotional responses to a selection of the Museum's collection.

The Galleria d'Arte Moderna (GAM) Case Study has developed a mobile game application Hi Gautam(GAM Game) which allows visitors to create stories to document their mood and reactions to the contents encountered during their visit to the museum. Working primarily with *Instituto dei*

Sordi di Torino and youth who are challenged of hearing, during the second year of the project, the curators and developers have organized sessions in which the content is made accessible in both the physical space of the Gallery as well as remotely. GAM game users are provided access to a template which they use to select assets from a sample prepared by the curator. Samples from the collection gathered for in-person visits will always differ from the samples used in online activities. They can add their own textual and visual descriptors (emojis) to this content. To promote reflection, the system might respond to their choices and suggest other content previously created by other users and representing their different emotional states. Working alone or in groups, visitors can use all these materials to write, revise and share their own stories documenting their – virtual or physical – visit to the Gallery.

In addition, to see the technical workflow that uses the LDH (Linked Data Hub) for the GAM artefact collection, please visit [7]D4.2 – Linked Data server technology, integrating feedback from use case requirements, Fig. 5.4.3.1.

4.3 Reflecting on the History of Political Conflict, Hecht Museum, Israel

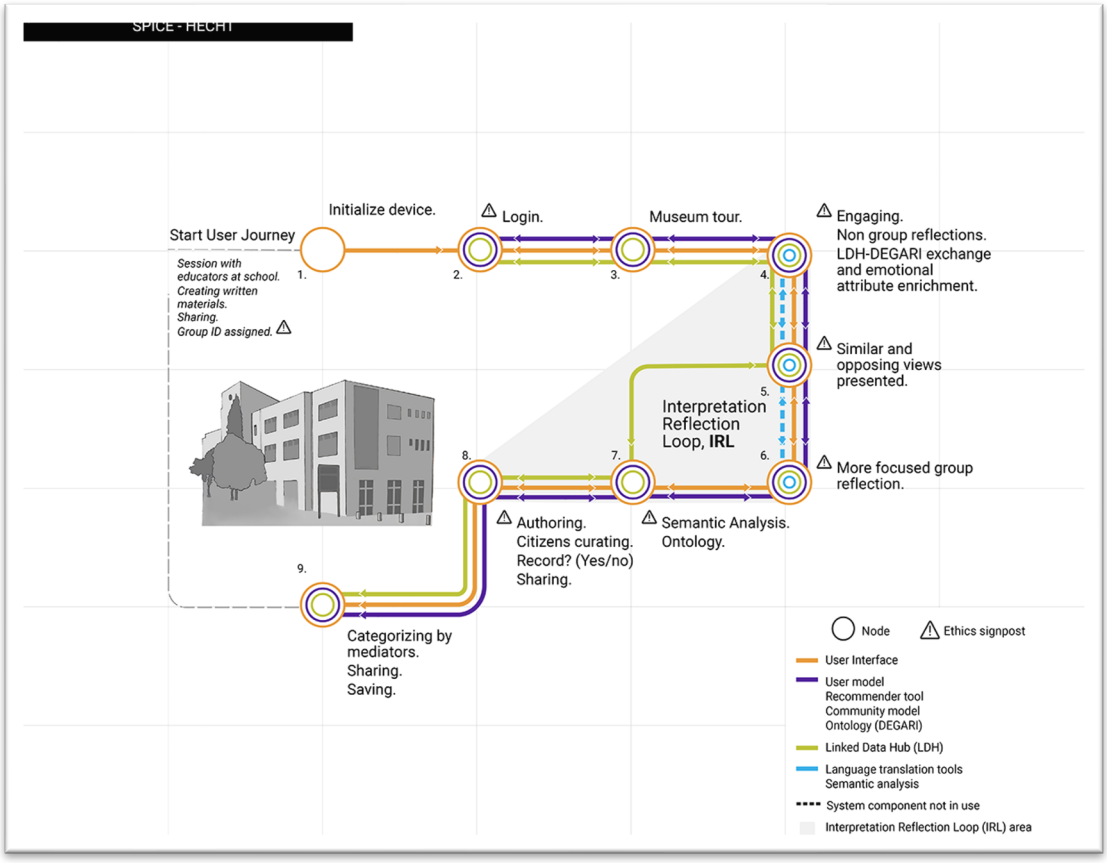

***Figure 4**: School educators work with Hecht Museum's Case Study developers promoting inquiry, reflection and interpretation into political conflict through narratives and encounters with artefacts in the museum's collection.*

7

During the second year of the project the Hecht's Museum case study has entered into a collaboration with secondary school(s) in Israel whereby it is the teacher who acts as mediator introducing the students to the artefacts and stories behind the Museum's collection. Individual students write texts in preparation for their visit. These texts are brought into the visit, reflected upon, and re-written during their session at the Museum, using the SPICE system. Throughout the interaction, the system presents similar as well as different views. Previously written texts are reflected upon, revised, and returned to the teacher.

4.4 "Slow Looking" Activities and Viewpoints Application at Irish Museum of Modern Art in Dublin, Ireland

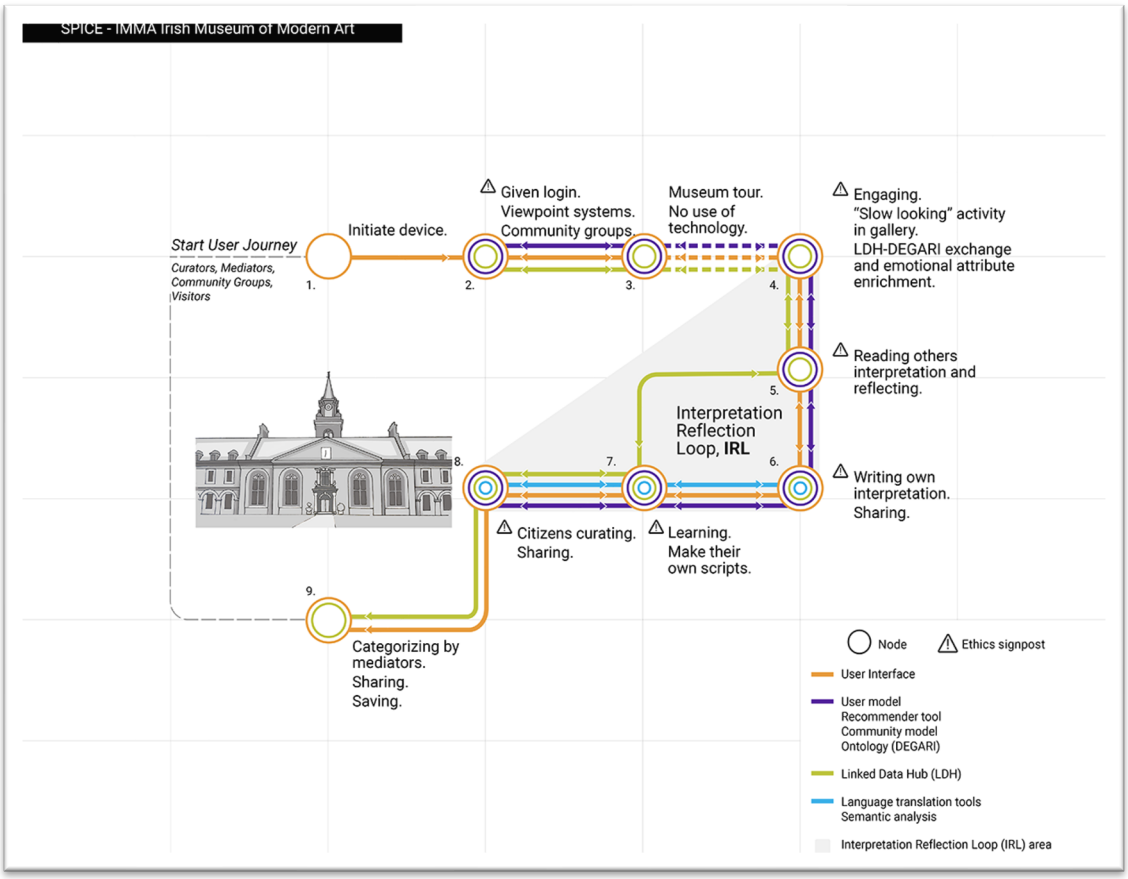

***Figure 5**: **Diverse** community groups come together in the Museum to explore, reflect and re-interpret contemporary art in the context of present-day societal issues, including identity.*

Throughout the second year of the project, Irish Museum of Modern Art, IMMA developed several activities to demonstrate and extend the use of SPICE system. These include a series of workshops that make use of the Viewpoints application and feature 'Slow-Looking' activities in the Gallery. In these activities visitors are encouraged to spend a significant amount of time engaged in a visual examination of the works in the gallery. Visitors are encouraged to read the comments and stories already entered into the system and reflect on the similarity (or difference) between these accounts and their own reflections and thoughts. The Deep Viewpoints application allows for the visitors to also organize the works they select for their stories according to topics and share them with others.

4. 5 Exploring sustainability with Treasure Hunt Game – Museo de Ciencias Naturales Madrid, Spain

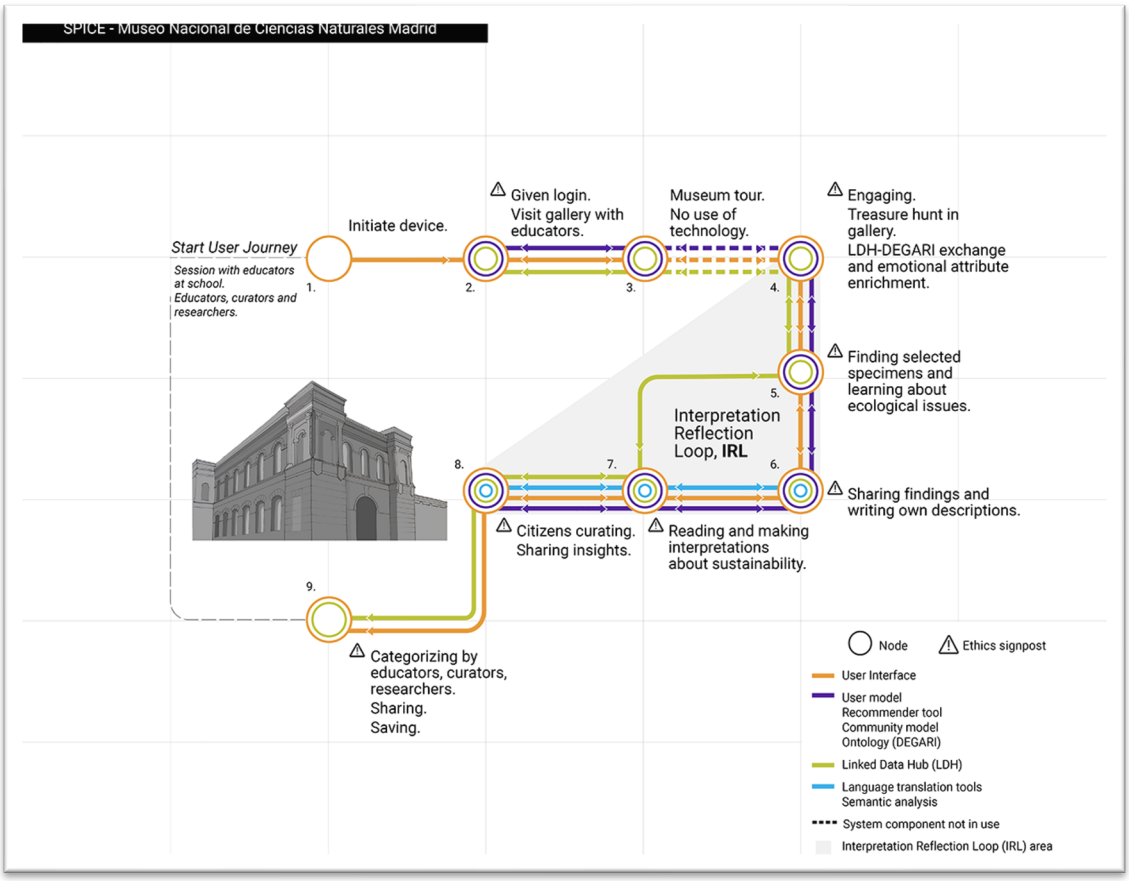

***Figure 6**: Educators, curators and game developers work with SPICE system to develop a Treasure Hunt activity that uses artefacts from the Museum's collection to promote exploration, reflection and interpretation of current ecological and sustainability issues.*

The Case Study in Spain is being carried on by PadaOne Games and Universidad Complutense de Madrid at *Museo Nacional de Ciencias Naturales Madrid*, MNCM. This Case Study involves the design and implementation of an activity for school groups that is composed of a visit to the museum, in the form of a gamified treasure hunt, and a post-visit activity reflecting about the impact of people on climate change and biodiversity. During the past year, the team has been working on the design, implementation, testing and evaluation of an initial version of the treasure hunt.

Case Study pilot	Interaction type	Application interface and medium
DMH – Pop-up VR Museum	Single/group	VR/AR application using the Unity engine
GAM – GAM game	Group	Web application for phones and tablets
HECHT – Historical dilemmas	Group	Web application for phones and tablets
IMMA – Deep Viewpoints	Single/group	Web application for desktops, phones, and tablets
MNCN – Treasure Hunt	Group	Game with AR components using the Unity engine.

***Table 1**: Case Study pilot applications along with their type of audience interaction, interface, and medium.*

In all the STS maps, the user journey routes for citizen curation taken by the Case Studies follow the same structure and trajectory with an identical legend characterizing the technical systems in SPICE (see D4.2 – Linked Data server technology: integrating feedback from use case requirements, Section 5 – SPICE pilots: applications and feedback). With the structure in mind, It is very important for each Case Study to take into consideration the ethical aspects of the points in the journey; these aspects are marked in the STS maps using the "Ethics signposts". Furthermore, involvement of the end-user community members and mediators is a key component of participatory and co-design for citizen curation and the type of engagement is outlined in each step of a Case Study's journey. However, the prominent differences in each Case Study are the steps taken (stops in the journey) due to the diversity in end-user communities, genre of pilot applications, and the variety of content for engagement with stakeholders. As seen in the STS maps, some of the Case Studies make use of specific SPICE technical systems while others do not, and these systems are used in different ways tailored to the needs of the Case Study's Museum. Overall, the STS maps of the Case Studies demonstrated earlier highlight different levels of a user's interaction and attempt to visualize as well as represent the complex nature of SPICE systems comprising a diverse set of social and technical infrastructure.

5 – THE PROJECT MANAGEMENT (PM) TOOL

The timelines for design and development of each Case Study and Work Package (WP) have been derived from the Project Management (PM) Tool in SPICE. The PM Tool is used by the partners to define and delegate tasks within activities conducted as well as examine a live view of development in order to monitor and communicate effectively between each other. To learn more about the design and inner workings of the PM Tool, please see D7.2 - Socio-Technical Roadmap with Project Management Tool (pp.42 - 46).

In the earlier STS journey-map visualizations, each point/stop of the journey is further subdivided into activities which are broken down into tasks in the PM tool. These tasks and activities comprise of the design and development of pilot applications and parts of workshops conducted by the Case Study Museums. Adhering to co-design, conceiving the tasks include discussion, definition, and delegation and are set to be complete within a specific timeframe.

Year 2 of the SPICE project involved several workshops and activities conducted by the Case Studies as well as progress in the design and development of the pilots. Much of this is described in extensive detail in D7.5 - Case Studies Progress and Plan. The snippets below (Figure 6 to Figure 10) include screenshots of the “Activities” and “Tasks” in each Case Study’s “Board” in the PM Tool between the time period January to April 2022. time period January to April 2022.

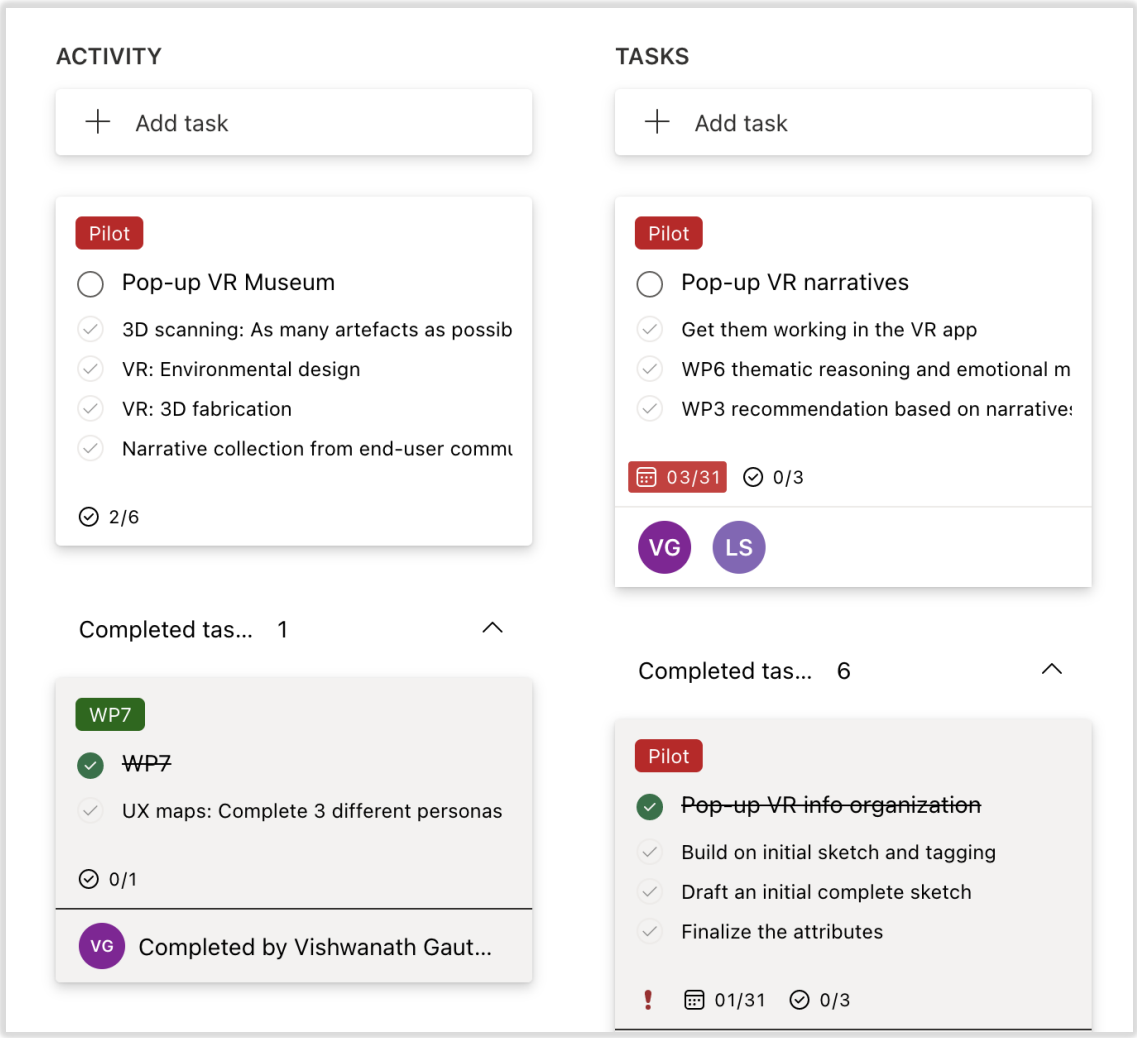

***Figure 7**: The PM Tool Board showcasing some of the activities and tasks of DMH between the time periods January to April 2022.*

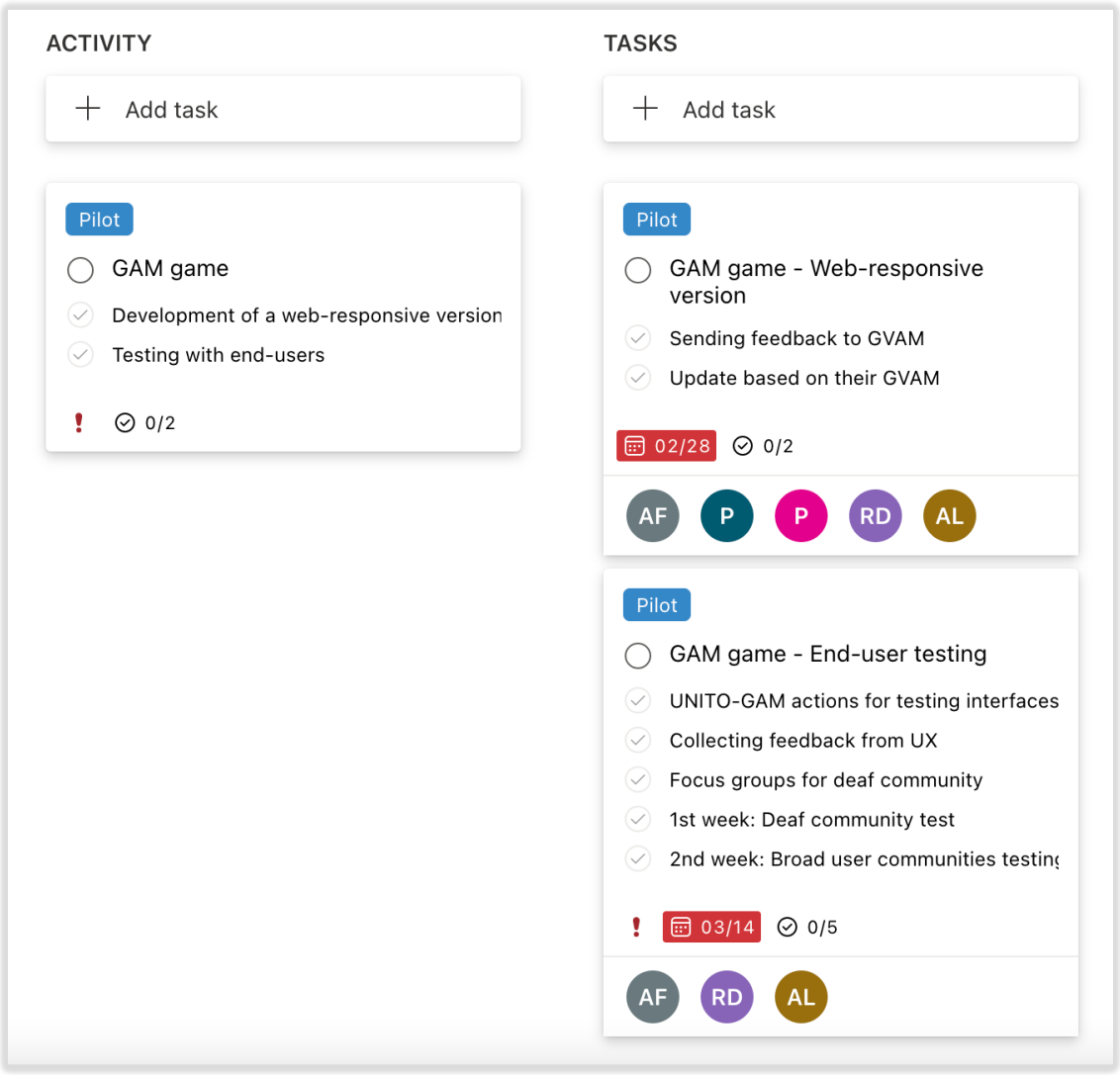

***Figure 8**: The PM Tool Board showcasing some of the activities and tasks of GAM between the time periods January to April 2022.*

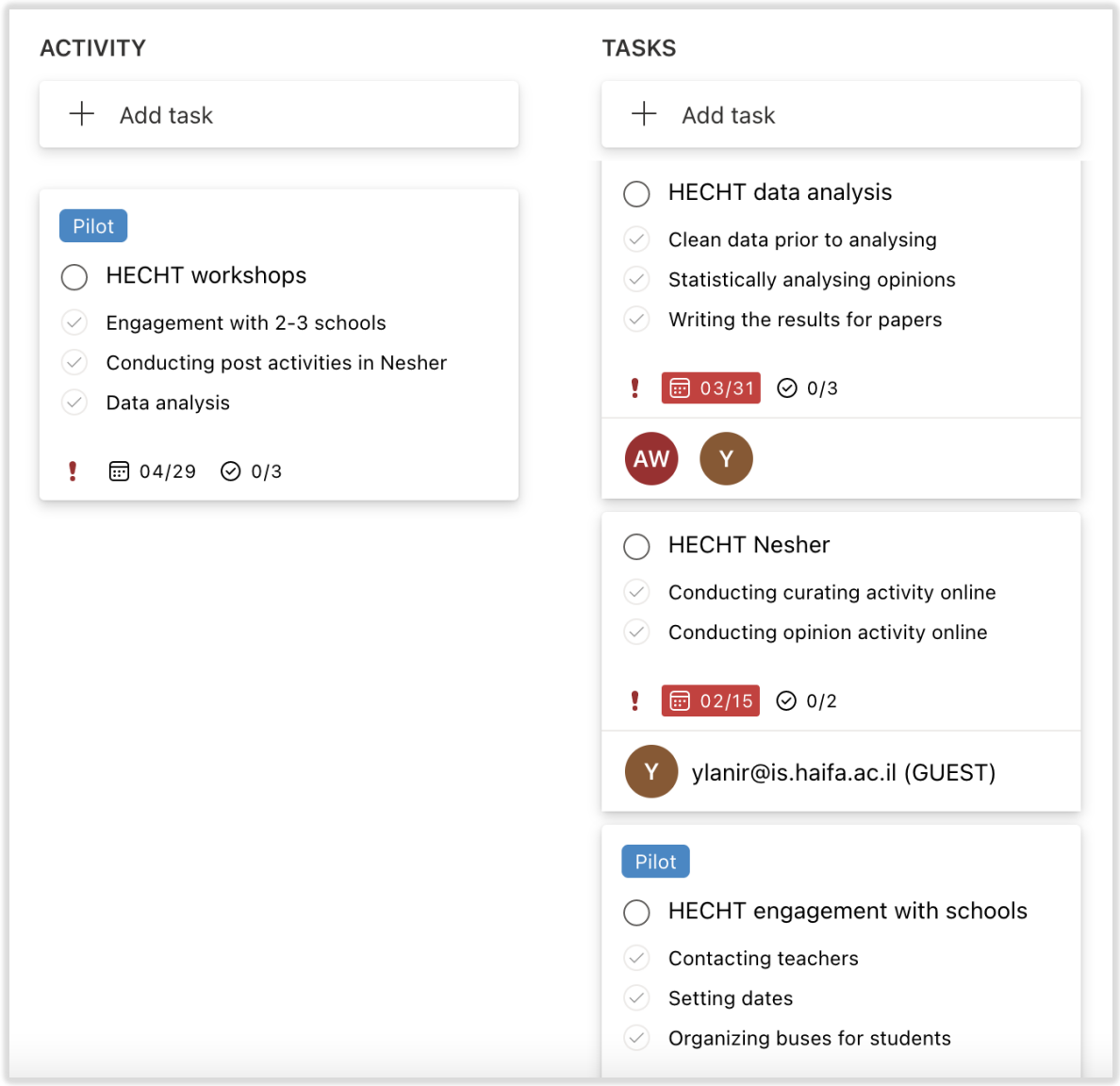

***Figure 9**: The PM Tool Board showcasing some of the activities and tasks of HECHT between the time periods January to April 2022.*

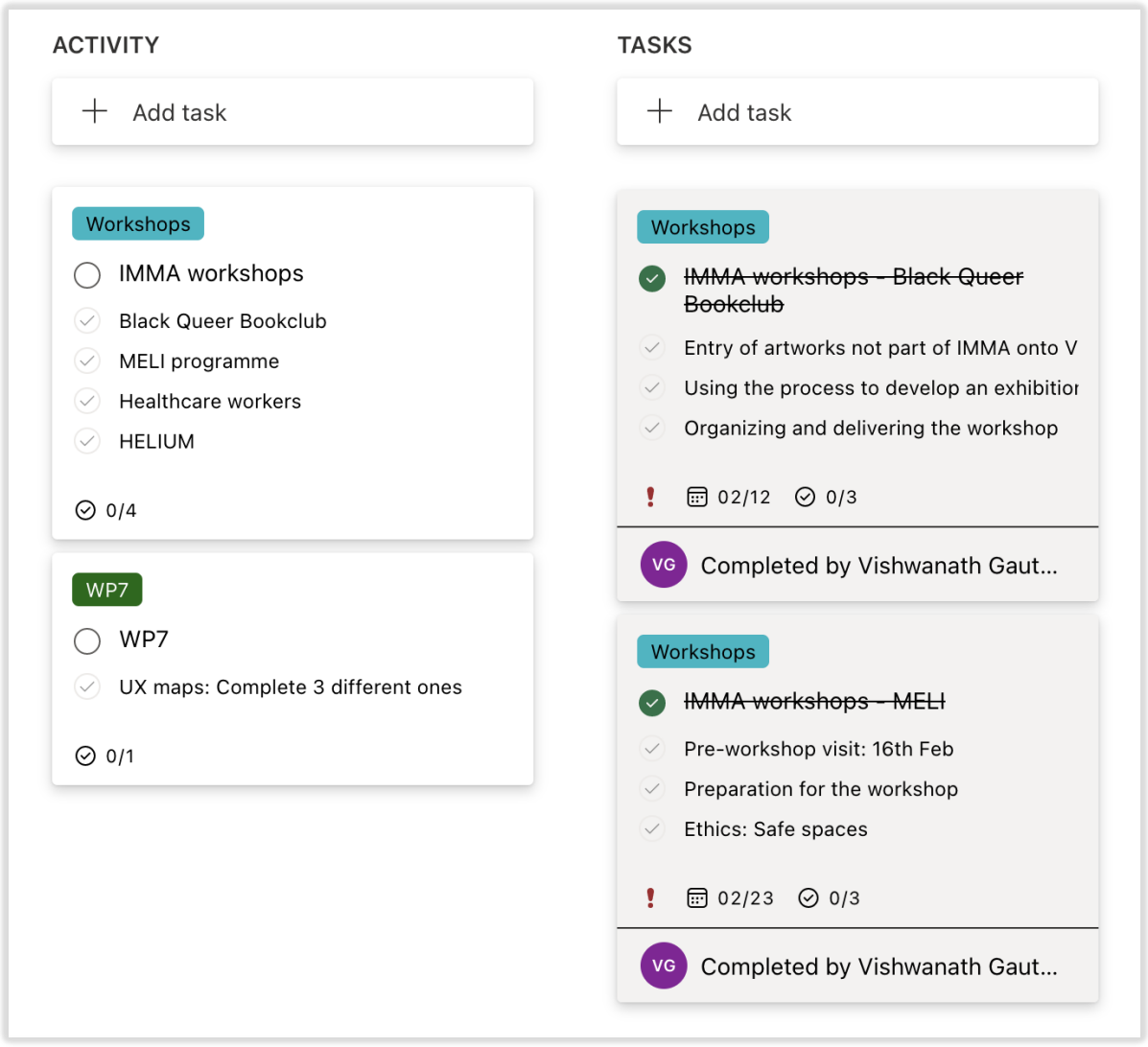

***Figure 10**: The PM Tool Board showcasing some of the activities and tasks of IMMA between the time periods January to April 2022.*

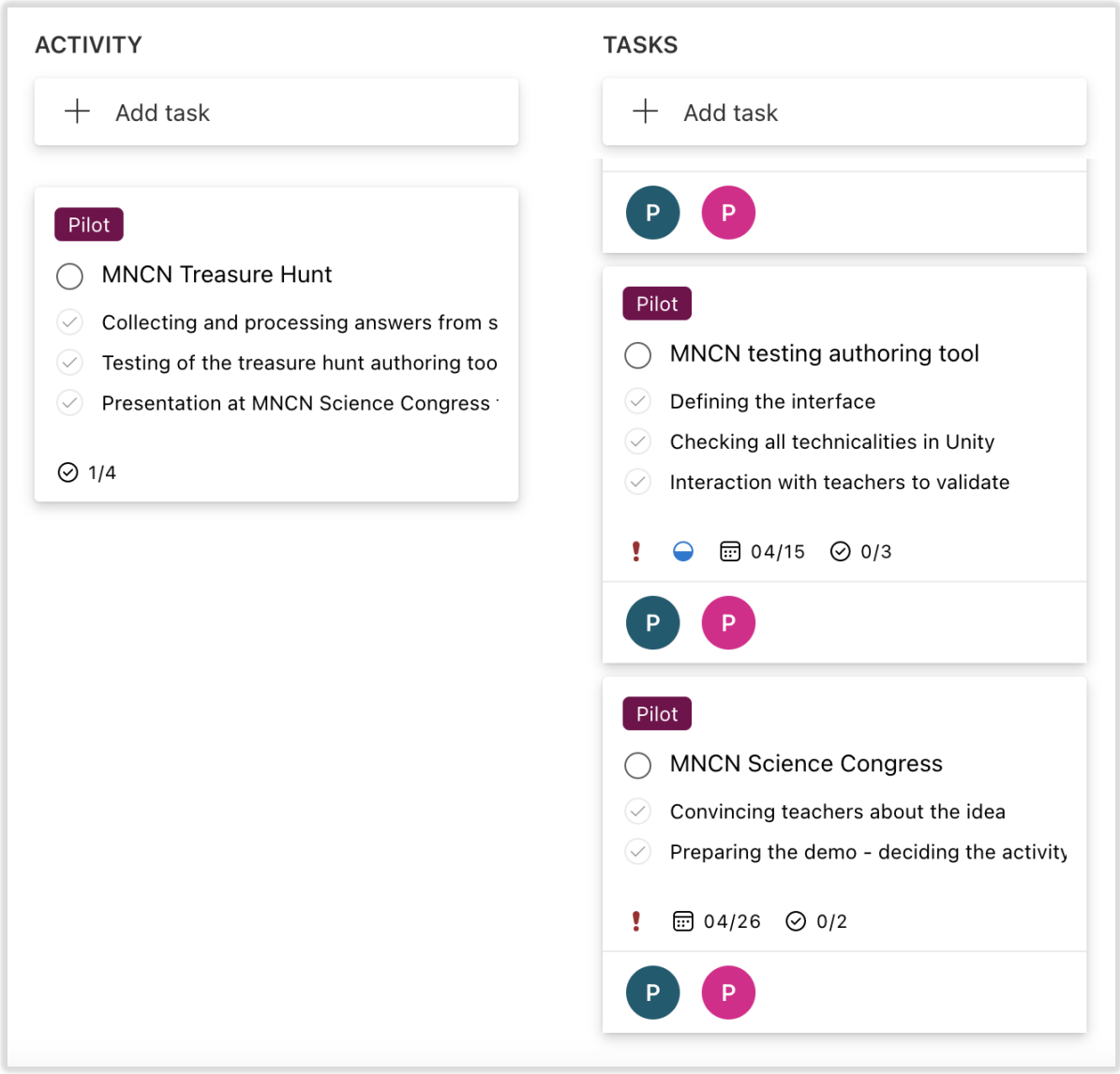

Figure 11: *The PM Tool Board showcasing some of the activities and tasks of MNCN between the time periods January to April 2022.*

6 – CONCLUSIONS AND DISCUSSION

Achieving transparency, when it comes to the social and technical aspects involved in AI hybrid human-machine interaction systems design, is not a simple task. For one, it could be argued that these types of systems which seek to combine machine human and machine intelligence are still in their infancy. Clearly there is a lot of work to be done for example in areas related to potential breach of privacy regarding personal data.

Then there is also the reality of the work being realized by a large team of interdisciplinary workers dispersed throughout several geographical locations during a period of unprecedented hardship (e.g., the Covid-19 pandemia) which has at times precluded direct access to their end user communities. As a tool, the map should assist developers, museum curators and designers in making basic information about the activities in the five Case Studies more accessible. In addition, it will enable us to compare how these pilot projects are testing the new systems' capabilities.

Beck's circuit-based network diagram map design inspired us to extend our understanding of processes related to mapping metaphors. Introducing the variables entailed in human interaction is what literally turns the system 'on' and sets the vehicle (e.g., the system) and the user in motion. Hence the nodes as placeholders or contact zones along the user journey. Following this metaphor, as significant socio-technical issues emerge, the ethic signposts can be regarded as red traffic signals that alert us to the need for reflection and discussion.

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