

## Exploring Design Methods for Digital Cultural Heritage Communities. The case of the IMPULSE Project

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### Abstract.

*The article presents the process of creating a Community of Practice within the Horizon Europe project IMPULSE, which explores how immersive technologies enhance access to digital cultural heritage (CH). The IMPULSE Community of Practice (IMCo) connects academics, students, CCI professionals, and artists with diverse expertise in CH. Rooted in Heritage Communities and Plural Design Communities literature, the study aligns with the Faro Convention and debates on democratic heritage management, framing heritage as a common good. It emphasizes technology's role in heritage narration and valorization, while outlining the IMCo's activation and results over three years. The article proposes a replicable model for hybrid community interaction, aiming to overcome fragmentation and foster integrated, collaborative ecosystems for cultural heritage.*

**Keywords:** Digital Communities; Cultural Heritage; Co-design; Immersive Technologies

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## Introduction

The article presents a case of application of the concept of Digital Communities by describing the experimental research conducted during the project IMPULSE<sup>1</sup>, funded under the Horizon Europe Programme of the European Commission for the period 2024-2027<sup>2</sup>.

IMPULSE is working on how to integrate immersive technologies and physical spaces to ensure the valorisation, accessibility, and re-use of various types of Cultural Heritage (CH) assets. This contribution specifically addresses the experiments related to the creation of a hybrid community of practice, activated as part of the co-creation and dissemination activities within the project.

The first section of the article aims to define the research field by analysing how Heritage Communities and community-based design practices can favour the participatory and sustainable management of CH assets. The second part describes the methodology applied in the IMPULSE project to build a Community of Practice focused on the digitisation of CH and its re-use by adopting immersive technologies. Finally, the third section analyses the results obtained within the first 24 months of experimentation and proposes future lines of research, emphasising the role of design as a mediator between skills and needs among diversified actors (Celaschi, 2008).

The adopted approach constitutes a replicable model that strengthens the link between local communities and digital spaces, contributing to innovative and resilient management of Cultural Heritage.

## Theoretical foundations: about communities and cultural heritage management

The Faro Convention (Convention on the Value of Cultural Heritage For Society), launched in 2005 by the Council of Europe introduces an innovative concept of cultural heritage, recognising the importance of the community formed around the cultural assets.

In 2011, Salvatore Settis (Bonini Lessing *et al.*, 2019) identified two distinctive elements of cultural heritage: the first concerns the ownership of the asset, which can be private or public; the second, emphasizes the ethical and cultural values belonging to the community, introducing the concepts of collective values and social responsibility, which lead to imagining forms of involvement of the various actors through pacts with civic society. Already in 2003, the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage<sup>3</sup> had introduced a new vision of the role of communities and groups of people in recognising certain “practices” as immaterial assets to be protected and regenerated, respecting cultural diversity, the environment and the rights of communities with a view to sustainable development. This has led to a new relationship between Cultural Heritage, the territory and its community, promoting processes and practices in which all actors work in a participatory way (Bortolotto, 2008) for its continuous regeneration.

The same Faro Convention in addition to overcoming the distinction between tangible and intangible heritage and the concept of ownership, aims to strengthen the value of cultural heritage for society by proposing an idea of widespread democratic participation. Cultural heritage is understood as a common good, highlighting the importance of citizens' involvement in the process of valorisation and, at the same time, broadening the meaning of the value attributed to heritage, promoting a multidimensional approach that reveals its contribution to social development. The Convention itself defines the concept of a heritage community as a group of «people who value specific aspects of cultural heritage and who wish, within the framework of public action, to sustain and pass them on to future generations» (Council of Europe, 2005, Art. 2b).

The notion of heritage communities of practice extends the 'right to heritage' to include not only its usage, enjoyment or exploitation, but also participation in the definition of new expressions and re-use of the same asset. It promotes respect for different interpretations, conflict management and the role of heritage as a vehicle for ethical and inclusive knowledge. It also highlights its impact in social, economic and cultural development processes, reinforcing its value for social cohesion and sustainability.

Moreover, according to Bortolotto (2010), the territory is no longer understood only from a geographical and morphological point of view, but as part of a collective network connecting people and other physical territories. Reference is made specifically to two concepts: the "cultural space", seen as a social context, and the "environment", understood as the complex of conditions (political, natural, etc.) that influence the regeneration of territorial practices. Both of these aspects reinforce the idea living intangible heritage (Pils and Trocchianesi, 2017, p.79) carried out by people and linked to territorial contexts, based on a shared origin and created collectively (Adell *et al.*, 2017), including through deliberate choices (e.g. communities of practice, of interest, of action).

An updated interpretation of the concept of 'community' can be interpreted through the lens of the link between cultural heritage and innovation, with the introduction of the Quadruple Helix model (Carayannis and Campbell, 2009). In this scenario, innovation-building processes are subject to the transfer of knowledge between different spheres of actors:

1. Academia and Universities
2. Business sector and Industry
3. Public Institutions and Government
4. The media and culture-based public (Carayannis and Campbell, 2009, p. 206).

To promote a more sustainable development, innovation systems are increasingly based on co-creation and co-generation processes, proposing the involvement of all actors in different ecosystems, both digital and physical.

The digital dimension of Cultural Heritage, promoted by the diffusion of digitisation practices dedicated to CH assets and by the evolution of digital systems and technologies, brings out new opportunities to preserve and access cultural heritage materials, involving the public up to a global scale, imagining increasingly plural communities of practice that can actively participate in the process of curating digital assets and collections. To ensure that those possibilities lead to positive innovation and overcome the difficulties that may arise by introducing digital systems (such as digital skills gaps), it is essential that Cultural Heritage organisations engage with communities to create new relationships through co-production and participatory practices. Using this approach, it is possible to produce enriched content through the diversity of voices and to engage the local community as active curators, creators and documenters.

How can collaboration between different actors be promoted to improve the definition, production and valorisation of digitised cultural heritage?

Several strategies have been proposed to address these new forms of cultural heritage, such as Design for/with/as Cultural Heritage (Formia *et al.*, 2019) or Design as Cultural Heritage Process. Starting from the definition of heritage communities, it can be assumed that digital communities act both as producers and as "guarantors" of the CH related to a given archive, collection or digital museum. This capacity for production allows the definition of CH to be extended to elements that were traditionally not included in this concept.

### The case of the IMPULSE Community of Practice

IMPULSE is a European-funded research and innovation project promoting the digitisation and immersive use of cultural heritage through cutting-edge technologies such as 3D representation and visualisation of cultural heritage assets in virtual reality environments.

The project aims to overcome fragmentation in the cultural digitisation sector by creating a more integrated and competitive ecosystem at European level. Immersive digital technologies such as VR, AR, XR and MUVES (Multi-User Virtual Environments) are not only considered as technical tools, but as means to widen accessibility to cultural heritage and to foster new forms of storytelling in different contexts (educational, artistic, productive). IMPULSE also proposes solutions for the interoperability of platforms for the standardisation of metadata creation processes of digital collections and exploration of legal frameworks related to DCH, so that cultural heritage can be reused in educational, artistic and creative contexts. In parallel with the development of technical solutions, IMPULSE works on the promotion of accessibility to cultural heritage also through the dissemination and involvement of actors at European level in the different phases of management, protection and enhancement of cultural heritage. The assets on which the IMPULSE project is working consist of digitised collections from Galleries, Libraries, Archives and Museums (GLAM) institutions located in Germany, Belgium, Poland, Malta and Greece that cover a broad spectrum in terms of content type, data type and historical reference periods to ensure the scalability of the proposed solutions. Connecting with the discourse of heritage communities and digital communities, the project adopted tools and spaces to create its own IMPULSE Community of Practice (IMCo). The IMCo has to be understood as a space where researchers, artists, cultural operators and local institutions can meet and discuss new perspectives for the digitisation of cultural heritage and its re-use by adopting a dedicated MUVE platform. In fact, among the main results of the project, there is the development and prototype implementation of a multi-user virtual world platform specifically dedicated to enabling co-creation with digital heritage assets, starting from the integration of digital assets obtained by IMPULSE featured collections (Mehmeti *et al.*, 2025). The software development phase, which covers almost the totality of the project, must be considered as strongly entangled with testing and feedback collection, and in this sense the IMCo can be considered as a way to both involve community and practitioners around the topic covered by the project, as a way to collect feedbacks useful for technical advancement and innovation, and finally as a way to better understand the possibility of co-creating with already digitised assets.

The development of the IMCo started with the drafting of a strategic roadmap, aiming at creating a dynamic environment for co-creation and sharing expertise within the Community. Among the main objectives of creating the IMCo as a space to test and validate technical solutions with people external to the project, the IMCo structure was defined to encompass the objectives to test other processes developed within the project, as for instance connected with metadata processes' simplification and standardization (Rontzova and Vandermeulen, 2025) or to Intellectual and Property Rights (IPR) regulations, and the objective to disseminate project advancements to favor their future exploitation or re-use. The IMPULSE project refers specifically to three targets, which are also the protagonists of the Community of Practice:

1. The academic sector (both researchers and students) finds an opportunity to explore new research methodologies and learning formats in this space.
2. Artists have access to advanced technologies to expand their expressive possibilities, collaborating with other stakeholders to develop works and projects that intertwine creativity and digital innovation.
3. The cultural and creative industries, as a productive sector, can utilize the Community to identify new business models, enhance competitiveness, and connect to international research and development networks.

The IMCo is composed both by the social infrastructure composed by the relations among its participants, by a digital space and temporary physical spaces promoted by the project and designed to enable or facilitate an interaction among them and with the project partners, creating a collaborative environment where ideas and inspirations can evolve in a structured manner. Considering that the central purpose of the community is to experiment and upcycle the results of the project, actions such as direct engagement and the adoption of dedicated UX research protocols<sup>4</sup>, allow members to test functionalities, analyse system dynamics, and provide feedback aimed at refining the project's technical solution in order to adapt it to the needs of cultural heritage practitioners. This process allows the prototype to be adapted to the concrete needs of users and to optimize its impact on a diverse audience, by taking into consideration that immersive technologies, which are both content and infrastructure of the Community, not only expand the possibilities for interaction and co-creation but also open new dimensions in the resilience of tangible and intangible cultural heritage (Sicklinger *et al.*, 2023).

Starting from these premises, the Community of Practice and its tools are shaped around the concept of Community-centered Design, recently redefined within the broader scope of territorial design (Brandson *et al.*, 2018). This approach addresses contemporary challenges by expanding the repertoire of investigative and operational tools to rethink the territory and develop regeneration scenarios based on the involvement of local communities (co-design, co-planning, co-delivery, co-assessment). In this context, IMCo, through its digital infrastructure based on Discord<sup>5</sup>, becomes a dynamic space for the exchange of knowledge and the construction of shared strategies. Participants can communicate using different formats such as video calls, chats, and microblogging actions within the same environment, and have the possibility to customize their user experience within the same server. Connecting the digital space with dedicated activities such as workshops, the community has the opportunity to select preferred modes of interaction (also in terms of time and engagement) according to the needs of each participant. In this way, this research places design "at the center of the transformation process" (Sicklinger *et al.*, 2019), promoting co-design methodologies that support digital communities to identify and enhance trans-local resources.

#### *The IMCo as a model for plural community: methodology*

The structuring of the IMPULSE Community of Practice occurs through a process that unfolds over the three years of the project. The methodology, conceived during the project proposal phase of IMPULSE and developed in the initial months of activity, involves three main actions:

1. Research and mapping of capacity and skills in Digital Cultural Heritage and immersive technologies;
2. Activation of hybrid workshops for the co-design of innovative technological supports;
3. Continuous collaboration in digital spaces.

Regarding action 1, “Research and mapping of capacity and skills”, project partners are tasked with identifying, based on their academic and professional networks, individuals or entities active in one or more areas of interest of the IMPULSE project. Building on existing networks allows for the creation of new relationships among subjects interested in the same fields and potentially equipped with complementary skills. Involved subjects includes research centers or departments in the field of cultural heritage studies (from preservation to innovative archival practices), entities that manage cultural heritage collections (such as GLAMs), cultural and creative industries (professional studios, SMEs, etc.) that are used to work with CH assets in their practices, and also artists and performers interested in local CH.

The exchange of knowledge and know-how occurs particularly through action 2, “Activation of hybrid workshops for the co-design of innovative technological supports”, where dedicated reflective spaces are offered around the prototypes developed by the IMPULSE project. These prototypes serve to facilitate networking among previously unconnected individuals and entities. During the IMPULSE project period, three hybrid workshops dedicated to different communities and a final hackathon are planned to bring these communities together around a common design challenge (Tab. 01).

Network building is continuously facilitated by the third action, “Continuous collaboration in digital spaces”, by the activation of the IMPULSE Discord Server, which offers a dedicated collaboration space and access to contents and events reserved for IMCo members.

The definition of the methodology arises from reflections related to two main research areas: on one hand, the activation of various open spaces aimed at collaboration around an emerging technology, both physical (workshops) and digital (IMPULSE Discord), refers to the concept of (digital) Living Labs (Hossain et al., 2019; Fujii et al., 2024). This is understood as an approach based on participatory design (Dell’Era & Landoni, 2014) aimed at building spaces of experimentation that connect people, cultural heritage, and digital systems, placing prototypical technological solution in a real-world context to produce innovation and transfer technology from research to applied situations. On the other hand, the decision to adopt immersive technologies, which makes it possible to explore virtual spaces using modes of perception that are like those used in physical spaces, refers to the relationship between digital systems and accessibility. This potentially allows for the simplification of human-machine interaction processes and the overcoming of barriers related to digital skills, which remain a widespread issue across Europe. Indeed, according to the indicators established within the DESI (Digital Economy & Society Index), the percentage of individuals with at least a basic level of digital skills in the population of the European Union member states is 55.56%. This figure drops to 27.32% when considering skills above the basic level<sup>6</sup>.

## Results and ongoing activities

At the time of the submission of this article, the IMPULSE project has completed its first two years out of three. The ongoing activities and related results can currently be grouped into three key takeaways:

1. Mapping of subjects active on IMPULSE-related topics;
2. Collaborative Workshop Framework;
3. Digital Collaboration.

Regarding the first point, the research group has conducted research and mapping of people and entities active in industry, academia and other fields (e.g. third sector or private foundations) that are active in the topics of interest for IMPULSE, namely cultural heritage preservation and management, digitisation practices for cultural heritage assets, and creative use of immersive technologies. The investigation started from individuating potential interested subjects in existing networks of the project, considering the professional relations entertained by its consortium partners. The selected subjects have been invited to pre-apply for the IMCo in order to access the IMCo Discord Server as the collaborative digital space for the Community of Practice.

Later, a targeted search of entities outside of the existing networks has been conducted to reach subjects outside of the existing consortium networks, in particular by individuating entities and industries which are active in other research and/or innovation projects at the European Level. This activity, which will be conducted for the whole duration of the project, is aimed at extending the IMCo, connecting it to other relevant networks and ensure its duration even after the end of IMPULSE activities. At the time of writing, the IMCo counts 118 members including IMPULSE researchers (68 out of 118).

Regarding the point of Digital Collaboration, activities has been conducted to develop a digital platform aimed at enabling continuous collaboration between the IMCo members and at offering a space for involving the members in the IMPULSE events. The Discord platform has been selected among the others because it offers a space dedicated only to the community members, it has a relatively user-friendly interface which makes it accessible to people who has at least basic digital skills and because it offers an high degree of personalization. The IMCo Discord Server has been designed to dedicate channels for three types of users with diversified degrees of accessing rights (Fig. 01):

- IMCo Members: have access to text channels to share materials, documentation, projects of interest of the community, to video channels for informal chats with other users and to the IMCo Community Stage in which online only micro-events can take place. The text channels are used also for sending invitations to IMPULSE workshops, events and opportunities.
- Workshop Participants: these users have the same accessing rights as IMCo members plus the access to the dedicated channels (text, video, other) used for collaborative group work during IMPULSE hybrid workshops. This functionality has been tested during the three IMPULSE workshop that have been conducted in Belgium, Malta and Germany and will be used as well during the Hackathon in Athens (June 2026).
- Partners: These users are part of the project's consortium. They have the same access rights as IMCo Members and Workshop participants plus dedicated channels for partner's only collaborative work.

This structure has been designed to ensure effective collaboration among diversified users while taking into account project's requirements, particularly related to the confidentiality of some results and aspects related to IPR protection and privacy.

Regarding the second point "Collaborative Workshop Framework", a general framework for ensuring feedback collection and validation of technical solutions has been defined to involve the different targeted user groups in different moments of development of the IMPULSE multi-user virtual environment (Fig. 02). In particular:

- The first workshop, held in Leuven in February 2025, was dedicated to feedback collection from academics and students. The workshop involved both external participants and participants internal to the consortium and was dedicated to reflecting possible learning scenarios using immersive technologies, starting from digital assets curated by KU Leuven Libraries. Participants had the opportunity to use a first version v.01 of IMPULSE MUVE platform, which presented limited functionalities. Feedback gained from this first group of users helped to define a list of preferred functionalities and to orient further development of the platform itself.
- The second workshop, held in Malta in September 2025, was dedicated to feedback collection from artists and art practitioners. The content of the workshop involved the use of a more advanced version of the MUVE platform, allowing users to interact and manipulate digital CH assets in virtual worlds. Participants were asked to take part in collaborative sessions aimed at defining VR prototypes for learning and artistic experimentation. The results of the workshop lead to the identification of design trajectories for three prototypes to be further developed within IMPULSE.
- The third workshop, held in Saarbruecken in February 2026, was dedicated to feedback collection from CCIs professionals. Designed as a hackathon-inspired format, the event started with the presentation of five challenges connected with a broader topic of creative experimentation with immersive technologies. Participants divided into five groups and had the opportunity to use a more advanced version of the IMPULSE MUVE platform, allowing functionalities such as uploading of own assets and embedding of audio files. The results of the workshop allowed both to gain feedback about the technical functionalities, and to evaluate a format to be adapted for final hackathon in Greece (June 2026).

Across all the three events, to reconnect with point 3 - "Digital collaboration", the IMPULSE Community of Practice server on discord allows for interaction and collaboration with remote participants. Replicating the use of the same digital space for the three events allowed to adapt the structure of the digital space in order to enable an easiest interaction and sharing of information among participants, providing the project with a digital space useful both for collaboration itself and for preservation of shared information. The same digital space, has been used to host collateral events<sup>7</sup>, organized by IMPULSE or by the IMCo members.

### Discussion, limitations and further applications

The experience of the IMPULSE Community of Practice demonstrates how the methodologies adopted for the construction of digital communities can be replicated and scaled in diverse contexts. The model supported the integration of various tools from co-design and participatory design, fostering collaboration among heterogeneous subjects with competencies, backgrounds, and interests. The digitization of Cultural Heritage through immersive technologies proved to be a topic of significant relevance, both for institutions such as museums, which are increasingly required to test innovative approaches in design, and for the scalability of the IMCo model itself in other areas. Experimenting with the Community of Practice showed that working with multiple modes of interaction, by including both physical events and digital spaces within the same conceptual framework, contributes to build an infrastructure which offers different possibilities for effective participation, allowing IMCo members to decide the level of engagement they want to bring. This infrastructure, other than providing the possibility to interact with existing digital CH assets, also provided the possibility to share intermediate projects results and to open spaces for discussion to a broader community before a formal publication, allowing both to gain useful feedback to project activities and to create more accessible ways for knowledge and information sharing. Among the limits of this approach, it has to be said that, despite providing appropriate technical equipment to ensure communication in hybrid formats (meaning the presence of both in-person and remote participants), the experience of the three Pre-Hackathon workshops shows that in-person participants presented a higher level of engagement. This is also due to the fact that the timing of hybrid events includes more informal moments (such as pauses), which are easier to engage with in contexts in which all participants share the same mode of participation. Another limit of this approach is that, despite giving the possibility to decide a personal level of engagement in terms of timing, the proposed workshop-based formats always required about two days of intensive work, making this a potential barrier for professionals who could dedicate less time.

However, the described experimentations suggest potential for broader applications, contributing to the building of plural communities and inclusive design, potentially contributing to further in-depth studies on the evolution of neo-inclusivity in design and its intersection with Community Design and Heritage Communities, which are considered still necessary to strengthen the social and cultural impact of digital communities. These studies will favor new collaboration models that are more open and interconnected. Future research prospects include, in addition to the completion of the application of the methodology within the IMPULSE project by its conclusion expected in 2027, the adaptation of the proposed tools and format for facilitating the replicability of the methodologies to different themes than those addressed by the project.

### NOTES

<sup>1</sup> <https://euimpulse.eu/> (Accessed on 26/02/2026)

<sup>2</sup> <https://cordis.europa.eu/project/id/101132704> (Accessed on 26/02/2026)

<sup>3</sup> Available at: <https://unesco.cultura.gov.it/en/convention/> (Accessed on 26/02/2026)

<sup>4</sup> More information about UX research protocols could be found in dedicated reports about the adopted methodology: <https://doi.org/10.5281/zenodo.17475409> and about a first pilot study: <https://doi.org/10.5281/zenodo.18300162> (Accessed on 26/02/2026)

<sup>5</sup> Discord is an instant messaging service born in the gaming environment but evolved and appreciated in very different areas thanks to the numerous functionalities proposed. The selection of the platform is also facilitated by the compliance of the service, US-based, with European regulations on the protection of privacy (GDPR).

<sup>6</sup> The indicators can be consulted on the interactive dashboard or in the individual DESI reports (up to 2022) and Digital Decade Report (starting from 2023): <https://tinyurl.com/5ydx5ypm> (Accessed on 26/02/2026)

<sup>7</sup> Documentation about collateral events, such as workshops conducted by single partners engaging with user groups can be found in this report: <https://doi.org/10.5281/zenodo.17482189> (Accessed on 26/02/2026)

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## Images

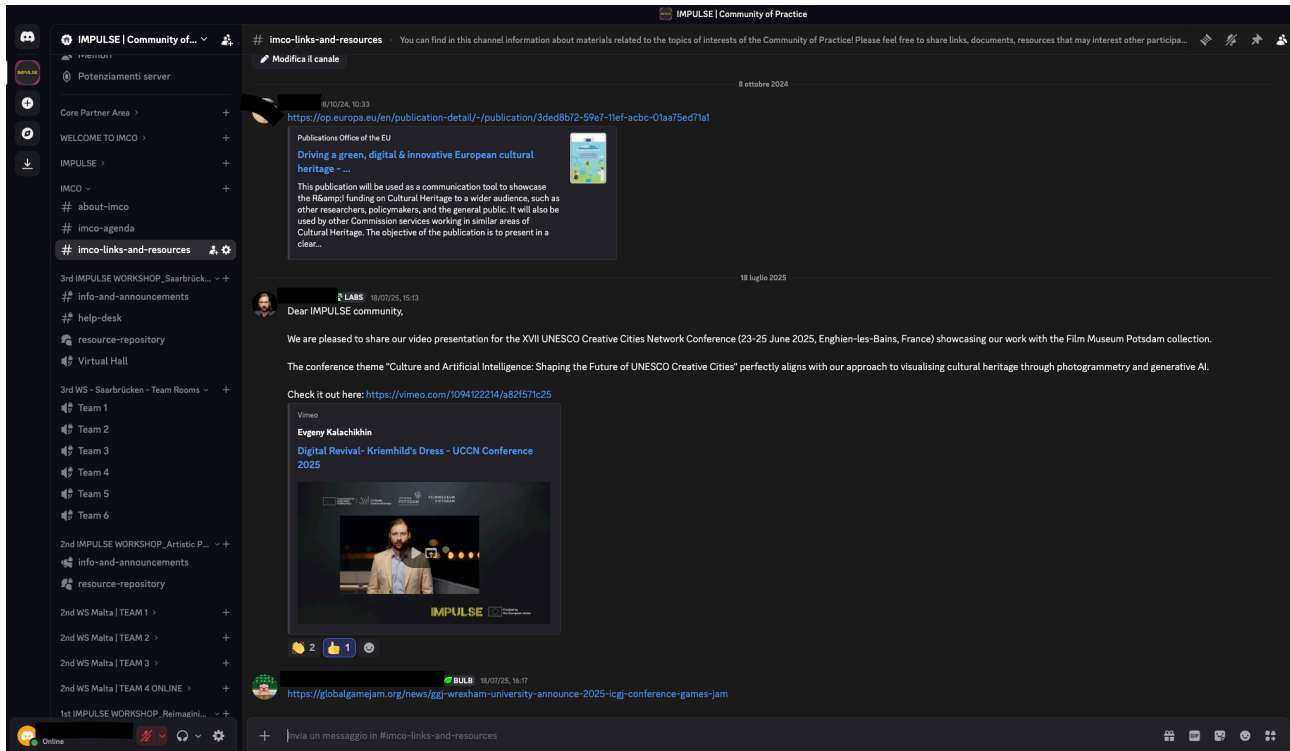


Fig. 01 – IMPULSE Community of Practice server structure (February 2026). Source: IMPULSE Project

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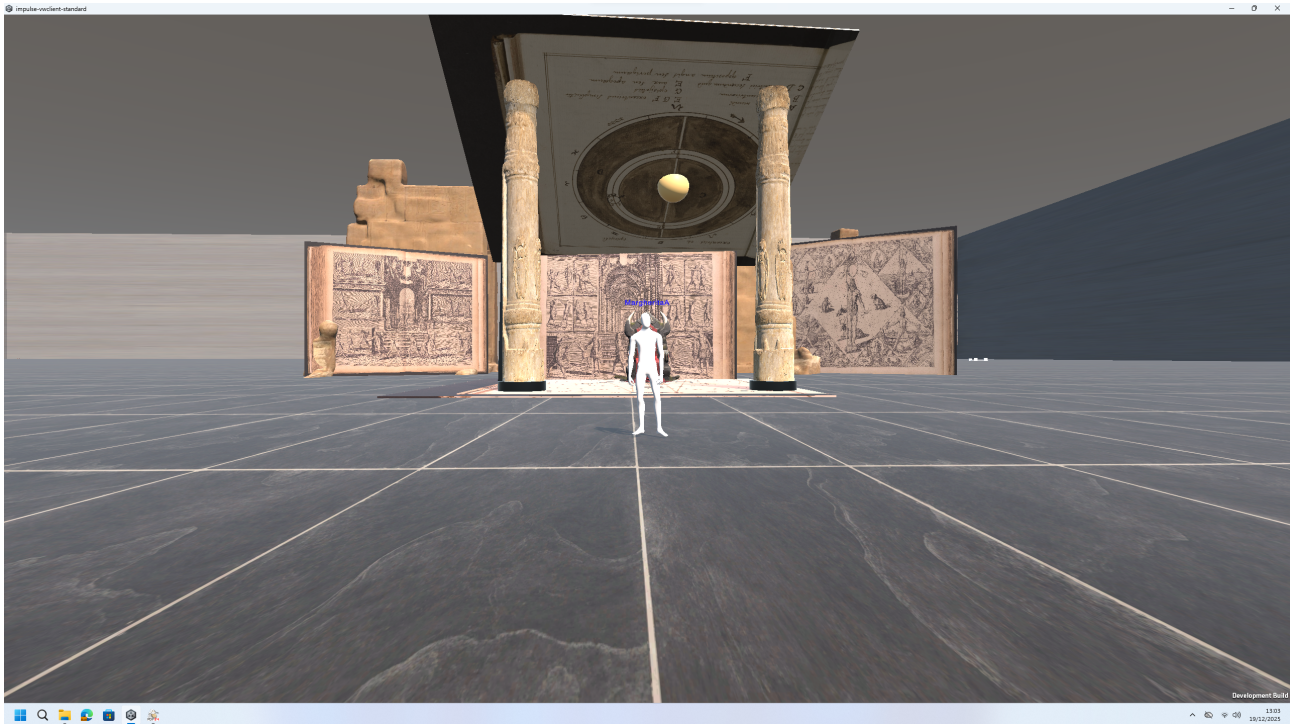


Fig. 02 - Screenshot captured from IMPULSE MUVE platform, showing a digital composition built by manipulating CH assets from KU Leuven Libraries collections. Source: IMPULSE Project

Just accepted

## Tables

Location	Target Group	Period	Led by
Leuven, Belgium	Students & Researchers	February 2025	KU Leuven
Gozo, Malta	Artists	September 2025	University of Malta
Saarbruecken, Germany	CCIs Professionals	February 2026	K8 Institut für strategische Ästhetik
Athens, Greece	All of the above	June 2026*	National and Kapodistrian University of Athens

Tab. 01 – Hybrid events dedicated to the IMPULSE Community of Practice.

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