5.5: Report on International Collaboration with Relevant Global Initiatives

Revision: v.1.0

Work package	WP 5
Task	T 5.4
Due date	30/04/2025
Submission date	30/04/2025
Deliverable lead	Insight Centre
Version	1.0
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Abstract	The OPENVERSE project is a European initiative aimed at helping establishing Europe as a global leader in the development and governance of Virtual Worlds technologies. With wide range of applications, the project addresses key challenges such as technology awareness, trend analysis, cross-sectoral collaboration, interoperability, ethics, intellectual property, and societal impact. This report outlines OPENVERSE's international collaboration strategy, focusing on alignment with global standards, partnerships, and EU policy values. Using a four-phase methodology—mapping, engagement, analysis, and dissemination—the project promotes global cooperation and knowledge exchange, reinforcing Europe's leadership in shaping an open, ethical, and interoperable virtual future.
Keywords	International collaboration, strategy, dissemination,

Grant Agreement No.: 101135701
Call: HORIZON-CL4-2023-HUMAN-01-CNECT
Topic: HORIZON-CL4-2023-HUMAN-01-23
Type of action: HORIZON-CSA

Document Revision History

Version	Date	Description of change	List of contributor(s)
V0.1	24/03/2025	1st edit	Dr Lukasz Porwol
V0.2	31/03/2025	Updates	Dr Abdul Wahid
V1.0	30/04/2025	Updates after internal review	Dr Abdul Wahid

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This work has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).

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Nature of the deliverable:	**to specify R, DEM, DEC, DATA, DMP, ETHICS, SECURITY, OTHER***	
Dissemination Level		
PU	*Public, fully open, e.g. web (Deliverables flagged as public will be automatically published in CORDIS project's page)*	
SEN	*Sensitive, limited under the conditions of the Grant Agreement*	
Classified R-UE/ EU-R	*EU RESTRICTED under the Commission Decision No2015/ 444*	
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* R: Document, report (excluding the periodic and final reports)

DEM: Demonstrator, pilot, prototype, plan designs

DEC: Websites, patent filings, press & media actions, videos, etc.

DATA: Data sets, microdata, etc.

DMP: Data management plan

ETHICS: Deliverables related to ethics issues.

SECURITY: Deliverables related to security issues

OTHER: Software, technical diagram, algorithms, models, etc.

EXECUTIVE SUMMARY

The OPENVERSE project is dedicated to the strategic positioning of virtual worlds within Europe. It addresses multiple facets of Virtual Worlds, including trend analysis, investigation of technological frameworks, intellectual property rights (IPR), ethics, experimentation with industrial use cases in robotics, and facilitating dialogue with initiatives at national, EU and international levels. Furthermore, the project aligns its findings with significant contributions from other EC Horizon Europe projects operating within this domain. A core element of the OPENVERSE project is to produce a technological framework for Virtual Worlds and the establishment of an observatory that tracks Virtual World technologies and initiatives in Europe. The primary goal is to consolidate knowledge, offer actionable recommendations, and formulate strategies that enable European SMEs to successfully enter and thrive in the global Virtual Worlds market, thus positioning Europe as a leading region in this rapidly evolving area.

This document was initially prepared to report on OPENVERSE activities related to international collaborations, alongside engagements with national and EU-level initiatives. However, the document has been restructured following the evolution of project focus and the discontinuation of the OPENVERSE Ecosystem Task Force (OETF) to focus on delivering practical outcomes. These outcomes are informed by both the evolving European virtual worlds landscape and the strategic priorities of the European Commission (EC), ensuring continued relevance and alignment with the broader policy and technological context.

In this revised version of the document, we outline a strategic approach focused on disseminating OPENVERSE project outcomes to international stakeholders. This strategy encompasses engagement with key standardisation bodies, such as the World Wide Web Consortium (W3C), and fosters collaboration and co-creation with related EU projects and initiatives actively interacting with international stakeholders. Notably, initiatives such as Next Generation Internet (NGI) and Web 4.0 are included in these collaborative efforts.

Those efforts will be coordinated and aligned with WP6, Impact creation, supported by relevant consortium partners, particularly in areas linked to pre-standardisation activities. Additionally, the document elaborates on the timing and methods for communicating specific consortium-generated assets to international stakeholders for their evaluation and consideration.

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ABBREVIATIONS

IP	Internet Protocol
TCP	Transmission Control Protocol
AR	Augmented Reality
VR	Virtual Reality
XR	Extended reality

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1 INTRODUCTION AND BACKGROUND

The OPENVERSE project aims to help strategically elevate Europe to a global leader in developing, deploying, and governing Virtual Worlds. Virtual Worlds represent a rapidly evolving frontier with transformative potential across diverse domains, including entertainment, education, industry, healthcare, and social interactions. Recognising this potential, OPENVERSE adopts a comprehensive approach to address key areas such as technological frameworks, interoperability standards, intellectual property rights (IPR), ethics and societal implications, and practical use cases in critical sectors like robotics and manufacturing.

The project also places significant emphasis on aligning its activities and findings with national, European Union (EU), and global initiatives, policies, and collaborative frameworks. This alignment ensures that OPENVERSE outcomes not only reflect European values of openness, inclusivity, privacy, and human-centric innovation, as outlined in the Commission Communication 'An EU initiative on Web 4.0 and virtual worlds: a head start in the next technological transition',[1] but also effectively integrate with broader international efforts. By proactively engaging with global standardisation bodies, industry-led initiatives, and strategic international partnerships, OPENVERSE seeks to maximise its global impact, foster innovation, and enhance Europe's competitiveness in emerging digital markets.

This report specifically addresses OPENVERSE's international collaboration strategy, mapping critical stakeholders, standardisation bodies, and global initiatives. It highlights existing synergies, identifies challenges, explores opportunities, and outlines strategic pathways for effective dissemination and international engagement.

1.1 OBJECTIVES

The primary objectives of this report and associated international collaboration efforts are as follows:

- **Identification of Key Stakeholders and Initiatives:**
  - Systematically identify and map relevant global initiatives, influential standardisation bodies, industry consortia, and collaborative platforms that shape the virtual worlds landscape internationally.
- **Strategic Alignment:**
  - Ensure that OPENVERSE activities, outcomes, and recommendations align with and actively contribute to international strategic agendas, fostering interoperability, shared standards, and cohesive policy frameworks globally.
- **Effective Dissemination and Communication:**
  - Clearly and effectively communicate the project's outcomes, best practices, insights, and policy recommendations to international stakeholders, leveraging

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52023DC0442

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tailored dissemination strategies and engagement activities to maximize uptake, adoption, and global influence.

1.2 METHODOLOGY

To accomplish these objectives, OPENVERSE employs a structured, multi-phase methodology comprising four interconnected phases:

1.1.1 Identification and Mapping

- **Stakeholder and Initiative Mapping:**
  - Conduct comprehensive mapping to identify key global stakeholders, including international standardisation bodies (e.g., W3C, ISO, IEEE, Khronos Group), influential industry consortia, EU-funded initiatives, and collaborative platforms operating in the virtual worlds domain.
  - Review and systematically analyse existing international frameworks, standards, policies, and projects such as those developed by the World Wide Web Consortium (W3C), Next Generation Internet (NGI), and Web 4.0 strategies to position OPENVERSE effectively within the broader global context.

1.1.2 Stakeholder Engagement

- **Structured Dialogue and Interaction:**
  - Establish and maintain structured dialogues with selected international stakeholders through strategically planned workshops, webinars, conferences, and participation in global forums.
  - Facilitate ongoing interaction with key global initiatives and EU-aligned international projects to promote collaborative research, joint innovation, knowledge exchange, and co-creation activities.

1.1.3 Analysis and Alignment

- **Outcome Analysis and Strategic Insights:**
  - Conduct rigorous analysis of engagement outcomes to identify key synergies, persistent gaps, emerging challenges, and actionable opportunities for strengthening international collaboration.
  - Align OPENVERSE's strategies, recommendations, and technical outputs with recognised global standardisation and pre-standardisation efforts, ensuring project findings support global interoperability and complement international innovation ecosystems.

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1.1.4 Dissemination and Communication

- **Tailored Dissemination Materials:**
  - Develop clear, concise, and tailored dissemination materials (reports, briefs, presentations, digital content) designed specifically for diverse international audiences, including technical stakeholders, policymakers, industry leaders, and SMEs.
  - Implement a structured, multi-channel communication plan, including digital outreach, events, webinars, newsletters, and stakeholder consultations, with a clear schedule for regular updates, reporting, and feedback collection to optimise ongoing international engagement.

Through this systematic and structured methodology, OPENVERSE aims to maximise the effectiveness, clarity, and global reach of its dissemination and international collaboration efforts, contributing significantly to Europe's leadership and influence in the global digital and immersive technology landscape.

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GLOBAL INITIATIVES AND STAKEHOLDERS

1.2 INTERNATIONAL STANDARDISATION BODIES

Engaging with major international standardisation bodies is essential for securing the long-term sustainability of Horizon Europe Coordination and Support Action (CSA) projects such as OPENVERSE. Collaboration with these bodies ensures that project results align with globally recognized standards and interoperability frameworks, laying a critical foundation for wider adoption, scalability, and effective integration of innovative solutions within global markets and ecosystems.

We list some of the major bodies in the spaces related to Virtual Worlds:

1. **World Wide Web Consortium (W3C)—Developing** standards for web-based virtual worlds, XR, and immersive technologies.
2. **International Organisation for Standardisation (ISO)—Standards** on multimedia, virtual worlds, XR interoperability, and related technologies.
3. **Institute of Electrical and Electronics Engineers (IEEE)—Standards** and working groups focused on immersive and augmented reality, XR ethics, and technology interoperability.
4. **International Telecommunication Union (ITU)—Working** groups on XR, network interoperability, and multimedia standards.
5. **Khronos Group—developer** of open standards for graphics, XR APIs (e.g., OpenXR), and 3D interoperability.
6. **Open Metaverse Interoperability Group (OMI)—a consortium** specifically addressing interoperability standards across Metaverse platforms and virtual environments

Name	Location
W3C	Cambridge, Massachusetts, USA
ISO	Geneva, Switzerland
IEEE	Piscataway, New Jersey, USA
ITU	Geneva, Switzerland
Khronos Group	San Francisco, California, USA
OMI Group	London, UK (Europe/USA)

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*Table 1: Location Mapping for Standardisation Initiatives. The table uses colour coding to indicate the geographic orientation of each standardisation body. Organisations based in the **United States** are highlighted in **dark red**, those headquartered in **Europe** (including Switzerland) are marked in **green**, and entities with a **dual presence or transatlantic scope** (such as those operating across both Europe and the USA) are shown in **orange**. This visual distinction is intended to illustrate the geographical distribution and influence of key players involved in shaping standards relevant to virtual worlds.*

1.3 ADDITIONAL INITIATIVES

In addition to globally recognized standardisation bodies, a diverse range of industry-led and non-profit initiatives play a vital role in shaping the future of Virtual Worlds, XR, and immersive technologies. These initiatives complement formal standardisation efforts by fostering innovation, promoting best practices, and accelerating the development and adoption of interoperability frameworks. Many of them are collaborative in nature, uniting stakeholders from academia, industry, and government across regions including Europe, North America, and beyond. The following list highlights key organisations and consortia that contribute significantly to the development of open standards, ethical frameworks, and technological interoperability critical to the evolution of the Metaverse and extended reality ecosystems. Several of these initiatives are also actively engaged by **Task 5.3** of the OPENVERSE project and are documented in greater detail in **Deliverable D5.3**. That deliverable outlines the nature of these engagements, their relevance to the project's objectives, and the strategic value of their contributions to the broader Virtual Worlds ecosystem. The alignment between these external efforts and OPENVERSE's goals further reinforces the project's commitment to interoperability, openness, and collaboration across both European and global standardisation landscapes

1. **Metaverse Standards Forum –** Industry consortium dedicated to accelerating interoperability standards for the Metaverse.
2. **XR Association (XRA)—A trade** association working on policies, standards, and best practices in the XR ecosystem.
3. **European Telecommunications Standards Institute (ETSI) –** Development of standards related to immersive and interactive media, multimedia distribution, and network technologies.
4. **MPEG (Moving Picture Experts Group)—MPEG**-I initiative for immersive media formats, including VR, AR, and immersive multimedia standards.
5. **Web3D Consortium –** Responsible for open standards such as X3D (Extensible 3D), enabling 3D content across diverse platforms.
6. **Open AR Cloud Association** - Non-profit consortium addressing interoperable standards for spatial computing, AR, and digital twins.
7. **IEEE Standards Association - Metaverse Initiative** - Dedicated efforts within IEEE to develop standards specifically for the Metaverse and related technologies.
8. **Open Geospatial Consortium (OGC)—Standards** supporting interoperability of geospatial data and virtual-world geographic representations.

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9. **Industrial Internet Consortium (IIC)—Developing** standards for digital twins, industrial VR/AR integration, and IoT interoperability within virtual worlds.
10. **Blockchain-based Standards Groups (e.g., Enterprise Ethereum Alliance, Hyperledger) – Addressing** interoperability and governance standards for blockchain-integrated virtual worlds and Metaverse economies.
11. **OASIS Open** - Open standards consortium working on specifications relevant to identity, security, and data interoperability in digital spaces.
12. **VR/AR Association (VRARA) – Industry** organisation facilitating collaboration, research, and standards advocacy for immersive technologies.

Name	Location
Metaverse Standards Forum	San Francisco, USA (Global)
XR Association (XRA)	Washington DC, USA
ETSI	Sophia Antipolis, France
MPEG	Geneva, Switzerland
Web3D Consortium	Mountain View, California, USA
Open AR Cloud Association	Oslo, Norway
IEEE Metaverse Standards Group	New Jersey, USA (Global ops)
OGC	Arlington, Virginia, USA
IIC	Needham, Massachusetts, USA
Blockchain Standards Groups (e.g. EEA, Hyperledger)	Distributed EU/USA
OASIS Open	Burlington, Massachusetts, USA
VR/AR Association (VRARA)	Washington DC, USA

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Table 2: Location Mapping for Additional Initiatives. Organisations highlighted in dark red are primarily based in the United States, reflecting North American leadership in immersive technologies and standards. Green indicates Europe-based organisations, including those in EU member states and associated countries. Orange represents initiatives with a hybrid or transatlantic structure, operating across both Europe and the USA or with a distributed global presence.

1.4 EU-FUNDED INITIATIVES

The European Union has made significant strategic investments in the development of Virtual Worlds, XR, immersive media, and enabling technologies through a wide range of research and innovation programmes. These EU-funded initiatives support the growth of a human-centric, open, and interoperable digital ecosystem across Europe. They contribute not only to technological advancement but also to ethical frameworks, societal impact, and the competitiveness of European SMEs.

From Horizon Europe projects to the Digital Europe Programme and regional innovation hubs, these initiatives are key to consolidating knowledge, building collaborative networks, and advancing the adoption of immersive technologies across sectors. Several of these efforts are also actively engaged by Task 5.3 of the OPENVERSE project and are detailed in Deliverable D5.3, which outlines their strategic relevance and contributions to Europe's Virtual Worlds roadmap.

The following list highlights key initiatives directly shaping the future of Europe's virtual worlds landscape.

1. **Next Generation Internet (NGI)—Initiative** promoting human-centric Internet technologies, including decentralized virtual worlds and interoperability.
2. **Web 4.0 and Virtual Worlds Strategy** - EU Commission strategy and funding program focusing on immersive virtual environments, decentralized technologies, and open standards for virtual worlds.
3. XR4ALL—an initiative aimed at strengthening Europe's XR ecosystem through innovation, standards, networking, and funding of XR-focused SMEs and startups.
4. **XR4Europe** - Continuation of XR4ALL, focusing on enhancing European competitiveness and supporting XR startups and innovation ecosystems.
5. **MEDIAVERSE** - Horizon Europe project developing an ecosystem for immersive multimedia content creation, sharing, and monetization.
6. **IVVES (Industrial Virtual Verification and Simulation Environment)—initiative** developing digital twins, virtual simulation environments, and verification technologies.
7. AI4Media—project fostering AI-powered solutions in immersive and interactive media and virtual worlds.
8. **VRTogether** (completed Horizon 2020 project, influential in ongoing research) - Focused on social VR, collaborative immersive environments, and media synchronization.
9. **CHARITY** - EU-funded project developing immersive AR and VR tools for educational and industrial training environments.

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10. **XRECO (XR mEdia eCOsystem)—Horizon** Europe-funded initiative focused on the creation of XR media ecosystems, interoperability, and XR media formats.
11. **eXtended Reality for All (XR4Human)—Aims** at ethical, inclusive, and accessible XR technologies and virtual environments for societal benefits.
12. **EUCloudEdgeIoT** – The initiative aims to realise a pathway for the understanding and development of the Cloud, Edge and IoT (CEI) Continuum by promoting cooperation between a wide range of research projects, developers and suppliers, business users and potential adopters of this new technological paradigm.
13. **TransMIXR** - Project exploring immersive media environments, content production, and interactive storytelling tools for virtual worlds.
14. **VOXReality** – Developing tools and standards for voice interactions in immersive virtual environments and XR experiences.
15. **Digital Europe Programme** - Large-scale funding programme supporting digital transformation projects, including virtual worlds infrastructure, digital twins, and advanced digital skills.
16. **European Digital Innovation Hubs (EDIHs)—networks** facilitating digital technology uptake, including VR/AR/XR in SMEs across Europe.
17. **Gaia-X Initiative** (partly EU-supported) - European initiative for sovereign data infrastructure, facilitating secure and interoperable data sharing in virtual worlds and digital twins.

1.5 KEY EU INITIATIVES FOSTERING INTERNATIONAL ENGAGEMENT

To ensure Europe remains at the forefront of global digital innovation, the European Union has launched and supported a range of initiatives aimed at fostering international cooperation in research, standards development, and immersive technology ecosystems. These initiatives build strong transatlantic and global partnerships, enabling knowledge exchange, joint R&D, and aligned policy development in areas such as virtual worlds, XR, AI, and next-generation internet technologies. By actively engaging with international stakeholders—from the United States and Canada to Asia, Africa, and beyond—the EU strengthens its position in global standardisation processes while ensuring European values of openness, ethics, and digital sovereignty are reflected in the evolving global digital landscape. The following initiatives exemplify Europe's commitment to meaningful international engagement in the context of emerging technologies.

1. **Next Generation Internet (NGI) - NGI International** - Facilitates collaboration between EU and US/Canadian stakeholders in next-generation internet technologies and policy frameworks.
2. **Horizon Europe – International Cooperation** - Dedicated actions within Horizon Europe fostering collaborative research and innovation partnerships between Europe and international partners, including the US, Canada, Japan, Australia, and beyond.
3. **ENRICH in the USA –** A strategic initiative supporting EU innovators, startups, and SMEs to connect and engage with the innovation ecosystems of the United States.

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4. **EU-US Trade and Technology Council (TTC)** - High-level platform for cooperation between the EU and the US, addressing standards, emerging technologies, digital platforms, AI, virtual environments, cybersecurity, and data governance.
5. **EU-Japan Centre for Industrial Cooperation – Promotes** technology transfer, R&D partnerships, and collaborative innovation between European and Japanese organisations in digital, robotics, virtual worlds, and XR.
6. **EU-Korea Digital Partnership** - Collaborative initiative promoting joint research, technological standards, interoperability, and innovation projects, including XR and immersive technologies.
7. **EU-India ICT Standardization Cooperation—**Facilitates dialogue, standardization alignment, and joint innovation projects in ICT, digital twins, virtual worlds, and immersive technologies between Europe and India.
8. **EU-Africa Digital Economy Task Force – Encourages** EU-African collaboration on digital transformation, emerging tech ecosystems, virtual worlds education, digital skills, and interoperability frameworks.
9. **EURAXESS Worldwide is a European Commission** initiative connecting researchers globally, promoting collaborative research and innovation between Europe and major research hubs including the US, Asia, and Latin America.
10. **EU-China Science and Technology Cooperation – Promotes** structured dialogue, joint research programmes, standardisation, and interoperability efforts with China in emerging technologies, digital platforms, and immersive environments.

1.6 KEY INITIATIVES SUPPORTING GLOBAL OUTREACH AND NETWORKING

To amplify the global impact of European research, innovation, and emerging technologies, the European Union supports a set of strategic initiatives aimed at expanding international outreach and networking. These efforts are designed to help European businesses, researchers, and institutions establish meaningful partnerships across continents, tap into new markets, and foster mutual growth. Through dedicated networks, diplomatic missions, and large-scale investment programs, the EU enhances its presence in key regions such as North America, Asia, Africa, and Latin America. These initiatives not only facilitate international collaboration but also reinforce Europe's role as a proactive global leader in digital innovation, sustainable infrastructure, and knowledge exchange. The following programs exemplify the EU's commitment to strengthening global connectivity and fostering international innovation ecosystems.

1. **European Network of Research and Innovation Centres and Hubs (ENRICH)** - Promotes internationalisation of European businesses and research organisations by providing strategic access to global markets, notably in North America, Brazil, China, and India.
2. **Enterprise Europe Network (EEN)** - Assists EU SMEs to establish strategic international partnerships, commercial collaborations, technology transfers, and innovation cooperation globally.

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3. **EU Delegations and Missions Abroad** - Provide strategic diplomatic and operational support, fostering cooperation with the US and other major global players in digital innovation, emerging technologies, and research partnerships.
4. **EU Global Gateway** - Europe's international investment and collaboration initiative, building strategic global partnerships in digital infrastructure, emerging technologies, connectivity, and innovation ecosystems worldwide.

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2 ANALYSIS OF INTERNATIONAL ENGAGEMENTS

2.1 SYNERGIES

The European Union's approach to international collaboration in the domain of Virtual Worlds and immersive technologies reveals a high degree of synergy with global partners. These synergies form the foundation for sustainable, interoperable, and human-centric digital ecosystems, and they are evident across strategic, technical, and infrastructural dimensions:

- **Aligned Strategic Interests:**
  There is strong alignment between the strategic priorities of the EU and its international partners—particularly the United States, Japan, Korea, and Canada—in fostering open and inclusive digital ecosystems. Shared values around digital sovereignty, data governance, privacy, and user empowerment contribute to a mutual commitment to building interoperable Virtual Worlds. This alignment reinforces collaborative efforts around ethical AI, trusted digital identities, and decentralised infrastructures.
- **Standardisation Efforts:**
  Collaborative standard-setting initiatives such as the **EU-US Trade and Technology Council (TTC)** and **NGI International** are instrumental in harmonising technical frameworks and protocols. These platforms allow for the joint development of standards related to virtual environments, XR technologies, immersive media formats, and interoperability. Such efforts are essential for enabling cross-border integration of platforms and services and preventing the emergence of fragmented, incompatible systems.
- **Complementary Strengths:**
  The EU brings a strong foundation in ethical frameworks, privacy-first innovation, and human-centric digital design, while international partners contribute complementary capabilities such as advanced hardware development (e.g., in the US and Korea), scalable digital platforms (e.g., in the US), and rapid technological adoption (notably in Asia and emerging markets). These complementary strengths create a balanced and mutually beneficial environment for technological exchange and co-development.
- **Joint Innovation and Research:**
  Programmes such as **ENRICH in the USA**, **EURAXESS Worldwide**, and **Horizon Europe's international cooperation tracks** provide structured pathways for joint R&D, innovation partnerships, and talent mobility. These initiatives foster long-term academic and industrial relationships that accelerate progress in fields such as digital twins, spatial computing, and AI-enhanced immersive experiences. They also enable the co-creation of use cases and prototypes that reflect diverse cultural and societal contexts.
- **Shared Infrastructure and Global Platforms:**
  Infrastructure-oriented initiatives such as the **EU Global Gateway** and cross-continental digital infrastructure projects contribute to a shared foundation for deploying Virtual Worlds at scale. These efforts support secure data exchange,

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federated identity management, and cloud-edge continuum frameworks that can underpin future immersive environments. By developing and promoting open infrastructure models, these initiatives reduce duplication, promote resilience, and increase access for a broader range of stakeholders globally.

2.2 GAPS AND CHALLENGES

While significant progress has been achieved in international collaboration around Virtual Worlds, immersive technologies, and digital frameworks, several gaps and persistent challenges continue to hinder seamless global cooperation. These challenges emerge from differences in technological approaches, regulatory frameworks, geopolitical considerations, varying levels of stakeholder participation, and funding structures. Addressing these gaps is essential for ensuring sustainable, inclusive, and globally interoperable virtual environments.

- **Fragmentation and Interoperability:**
  Despite numerous initiatives aimed at harmonising standards and practices globally, fragmentation remains a substantial barrier. Technological standards, interoperability frameworks, and data management practices differ significantly between the EU, the US, and Asia, making unified global solutions challenging. Such fragmentation not only limits the scalability and integration of virtual worlds but also increases complexity and costs for developers and end-users, hindering broader adoption.
- **Regulatory Divergence:**
  Regulatory differences, particularly around data protection and privacy, pose significant barriers to seamless international collaboration. The EU's GDPR framework, while setting high standards for privacy and data protection, often clashes with less stringent or fundamentally different regulations in other regions. These regulatory mismatches lead to complexity in cross-border projects, data exchange restrictions, increased compliance burdens, and slower innovation processes, ultimately constraining international collaborative efforts.
- **Geopolitical Tensions:**
  Escalating geopolitical tensions—particularly among the EU, the US, and China—pose a growing threat to smooth international collaboration. Issues surrounding digital sovereignty, technology transfer, cybersecurity, and strategic leadership in emerging technologies frequently shift the environment from cooperation towards competition. These tensions can limit trust, reduce transparency, and create barriers that restrict joint innovation efforts, investment flows, and technology exchanges critical for collaborative growth in the virtual worlds space.
- **Uneven Participation:**
  Another significant challenge lies in the uneven participation of SMEs, startups, and innovation ecosystems across different regions, especially within less digitally mature EU member states and developing countries globally. Limited access to global networks, knowledge bases, and funding opportunities prevents equitable participation, reducing the diversity of innovation and potentially excluding valuable perspectives and contributions. This disparity risks creating further digital divides, undermining the inclusive and democratic principles promoted by European initiatives.

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- **Funding Limitations:**
  EU-funded initiatives, although strategically aligned and impactful, often face limitations in scope, duration, and available financial resources. Short-term funding cycles and finite budgets can inhibit the depth, continuity, and effectiveness of global engagement efforts. Sustained international collaboration typically requires long-term investments, flexible funding mechanisms, and the ability to respond swiftly to evolving technological and geopolitical landscapes. Funding constraints thus risk weakening the overall sustainability and global impact of European-led innovation programmes.

2.3 OPPORTUNITIES:

The evolving landscape of Virtual Worlds and immersive technologies presents significant opportunities for the European Union to leverage its strategic international engagements for tangible global impact. By capitalising on collaborative frameworks and partnerships, the EU can solidify its leadership role, enhance market access for European innovators, jointly address critical global challenges, and support digital skills and capacity development globally. These opportunities not only foster technological innovation and economic growth but also position Europe as a global advocate for human-centric, inclusive, and sustainable digital transformation.

- **Global Leadership and Standardisation:**
  The EU has a strategic opportunity to assert and strengthen its global leadership position by actively influencing the development of international standards in Virtual Worlds and immersive technologies. Collaborations through established standards bodies such as the World Wide Web Consortium (W3C), Khronos Group, IEEE, and the Metaverse Standards Forum allow Europe to shape technical specifications, interoperability protocols, and ethical guidelines. This proactive role in global standardisation can help ensure the long-term sustainability, openness, and inclusivity of virtual environments and technologies worldwide.
- **Broader Market Access:**
  International collaborative initiatives and partnerships create vital pathways for European businesses, particularly SMEs and innovative startups, to enter and thrive within established global technology ecosystems. Enhanced connections with prominent innovation clusters in Silicon Valley, dynamic markets in Asia, and rapidly growing digital economies in Africa and Latin America offer extensive commercial opportunities. Such market access can significantly accelerate the growth of European technology firms, broaden the reach of EU-developed solutions, and increase Europe's global competitiveness in emerging digital markets.
- **Joint R&D and Innovation Ecosystems:**
  Strengthening research and development (R&D) partnerships with leading international technology players—including the US, Japan, Korea, India, and Africa—can amplify Europe's innovation capacity. Such collaborations allow for leveraging

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complementary strengths and resources, fostering breakthroughs in fields such as spatial computing, digital twins, extended reality, and advanced AI. By actively engaging in global innovation ecosystems, European organisations can benefit from diverse perspectives, cutting-edge research, and co-created technologies that address the evolving needs of global markets and users.

- **Addressing Global Challenges:**
  Europe's robust international cooperation frameworks—such as the EU-US Trade and Technology Council (TTC), Next Generation Internet (NGI) International, and the EU-Africa Digital Economy Task Force—offer structured channels to jointly address pressing global challenges. These include reducing digital inequality, creating sustainable and resilient digital infrastructures, and developing ethical frameworks for AI and immersive technologies. International collaborations enable pooling resources, expertise, and innovations to tackle these societal issues effectively, ensuring that the benefits of digital transformation are inclusive and widely distributed.
- **Enhanced Digital Diplomacy:**
  International engagements in technology standardisation and innovation serve as valuable instruments for Europe's digital diplomacy, amplifying the EU's influence in global tech governance. By taking a proactive diplomatic stance, Europe can advocate for policy approaches aligned with its core values, including privacy, data protection, transparency, inclusivity, and fairness. Such diplomatic efforts can also facilitate more cohesive global dialogues on technology regulation, cybersecurity, and cross-border digital cooperation, reinforcing Europe's strategic position on the international stage.
- **Capacity Building and Digital Skills:**
  EU-supported international collaborations also present significant opportunities for digital skills development and capacity building globally, especially in emerging and developing regions. Through structured knowledge-sharing initiatives, training programmes, and cross-border educational partnerships, Europe can promote digital literacy, enhance technical capacities, and foster expertise aligned with European values and standards. Such capacity-building efforts not only support equitable digital development but also strengthen long-term international partnerships and reinforce Europe's reputation as a global leader in responsible digital innovation.

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3 STRATEGY FOR DISSEMINATION AND COLLABORATION

3.1 COMMUNICATION APPROACH

Effective dissemination and communication (also explained in D4.2. First Dissemination and Communication Activities Report) of project results are crucial to maximising the impact and global uptake of innovations developed through EU initiatives such as OPENVERSEOPENVERSE. The communication strategy outlined here aims to ensure that project outcomes, insights, and recommendations are shared effectively and meaningfully with a diverse range of international stakeholders. This includes standardisation bodies, industry leaders, governmental policymakers, SMEs, and innovation ecosystems globally. A structured, targeted, and multi-channel approach will be employed to guarantee that the dissemination activities resonate with each stakeholder group and foster sustained engagement, collaboration, and co-creation.

- **Clarity and Precision:**
  Communication efforts will prioritise clarity and precision, ensuring that complex project outcomes, technical standards, and policy recommendations are clearly articulated in accessible, stakeholder-appropriate language. This approach enhances understanding, reduces ambiguity, and facilitates informed decision-making and effective collaboration across diverse international audiences.
- **Targeted Messaging:**
  Tailored and audience-specific messaging will be developed to address the distinct interests and needs of different stakeholder groups. Standardisation bodies will receive detailed technical insights and interoperability frameworks, while policymakers will be presented with strategic policy implications and governance recommendations. SMEs and industry partners will benefit from practical use-case demonstrations, business opportunities, and implementation guidelines, ensuring that communications are relevant and actionable.
- **Active Engagement:**
  The strategy emphasises continuous, active engagement with stakeholders through participation in and organisation of various interactive forums. Events, workshops, webinars, and co-creation sessions will be leveraged to build deeper relationships, enable knowledge exchange, and solicit direct input. Such active engagement will facilitate ongoing dialogue, collaboration, and mutual learning, ultimately enhancing stakeholder ownership and adoption of project results.
- **Multi-Channel Dissemination:**
  Dissemination activities will utilise a comprehensive range of communication channels to maximise reach, visibility, and impact. This includes leveraging digital platforms such as websites, dedicated project portals, and social media networks, complemented by technical reports, policy briefs, stakeholder newsletters, and participation in international conferences and symposia. The diversified multi-channel approach ensures broad accessibility and continuous engagement across multiple stakeholder groups and geographical regions.

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- **Regular Feedback Loop:**
  To ensure continuous improvement and relevance, the strategy incorporates structured mechanisms for regular stakeholder feedback. Surveys, feedback forms, interviews, and interactive discussions will be systematically employed to collect stakeholder insights, measure communication effectiveness, and refine messaging and dissemination tactics. This regular feedback loop supports adaptive communication practices, increasing responsiveness and alignment with stakeholder expectations, evolving priorities, and emerging trends.

3.2 TIMELINE AND MILESTONES

The successful implementation of the international dissemination and collaboration strategy requires careful planning, structured execution, and clearly defined milestones. The timeline below provides a comprehensive overview of critical activities scheduled for each quarter from mid-2025 through early 2026. This roadmap will guide the project team in systematically engaging stakeholders, producing timely deliverables, and monitoring progress to ensure the achievement of objectives and the impactful dissemination of OPENVERSE outcomes.

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Quarter	Milestones and Activities
Q2 2025	- **Stakeholder Mapping and Engagement Plan Finalisation:** Comprehensive identification and analysis of key international stakeholders, defining clear engagement strategies tailored to their interests and needs. - **Initial Dissemination Materials Developed and Shared:** Production of initial communication packages, including overview documents, technical briefs, and digital content, to introduce stakeholders to project objectives and expected outcomes.
Q3 2025	- **Launch of International Stakeholder Webinar Series:** Initiation of regular webinars aimed at informing stakeholders, fostering dialogue, and soliciting direct input. - **Presentation at Key Standardisation Events:** Active participation and presentation of project insights at significant international events, including W3C Technical Plenary and Advisory Committee (TPAC), IEEE Virtual Reality conferences, and other industry-relevant forums. - **Mid-year International Engagement Report:** Compilation and dissemination of progress updates, capturing stakeholder feedback, preliminary outcomes, and ongoing adjustments to engagement strategies.
Q4 2025	- **Organisation of Co-creation Workshops:** Hosting targeted workshops with selected international partners such as NGI International and the Metaverse Standards Forum, aimed at collaborative innovation, joint problem-solving, and standardisation activities. - **Dissemination at Relevant Global Forums:** Active dissemination and representation of project outcomes at influential global forums, notably the EU-US Trade and Technology Council (TTC) Annual Forum, enhancing visibility and fostering strategic collaborations.
Q1 2026	- **Review and Refinement of Dissemination Strategy:** Comprehensive review of dissemination outcomes and effectiveness, incorporating stakeholder feedback to adjust and optimise the communication approach. - **Annual International Collaboration Summary Report:** Publication of a detailed report summarising achievements, insights gained, collaboration impacts, and recommended next steps. - **Public Launch of OPENVERSE International Observatory Portal:** The official launch of an interactive, publicly accessible online platform that extends the existing OPENVERSE Observatory. While the current Observatory provides structured monitoring of Virtual World technologies and initiatives within Europe, the new portal expands this scope to facilitate global visibility, resource sharing, and cross-regional engagement, promoting OPENVERSE outcomes and fostering broader collaboration.

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3.3 ROLES AND RESPONSIBILITIES

Successful international dissemination and collaboration activities depend on clearly defined roles, responsibilities, and coordinated teamwork. To ensure coherent execution of the dissemination strategy and maximise stakeholder engagement, responsibilities are allocated across key roles within the OPENVERSE consortium. Each role is designed to leverage specific expertise, ensuring effective delivery, clarity in communication, strategic alignment with sustainability objectives, and efficient use of resources.

- **WP6 Lead (Sustainability):**
  The WP6 Lead holds overall responsibility for the strategic direction, planning, and coordination of international dissemination and collaboration efforts. This role involves managing high-level stakeholder relationships, ensuring strategic alignment of dissemination activities with long-term sustainability objectives, and overseeing interactions with international standards organisations and key global partners. The WP6 Lead ensures integration of international engagement efforts into the broader project sustainability framework.
- **Communication and Dissemination Manager (WP4):**
  The Communication and Dissemination Manager is responsible for the tactical implementation of the dissemination strategy, including creating, refining, and regularly updating dissemination content such as project overviews, policy briefs, and technical documentation. This role also encompasses organising and managing communication campaigns, events, workshops, interviews and webinars, as well as maintaining digital communication channels such as websites, social media, newsletters, and project portals. The Manager acts as the central point of coordination for all external communication activities.
- **Consortium Partners:**
  Consortium Partners play a crucial role in actively supporting dissemination and collaboration activities. Partners are expected to participate in events, webinars, workshops, and stakeholder meetings, bringing their specialised knowledge and sector-specific insights to international audiences. Additionally, partners contribute to the development of dissemination content and help ensure project outputs are accurately represented and effectively communicated, aligning closely with the expectations and interests of global stakeholders.
- **Technical/Content Experts (from relevant WPs):**
  Technical and Content Experts from relevant Work Packages (WPs) are essential for providing detailed, accurate, and clearly articulated technical content for dissemination materials. Their expertise ensures that communications are both credible and relevant to stakeholder needs. Experts also play a key role in supporting direct technical discussions, engagements, and interactions with international standardisation bodies and stakeholder groups, ensuring the project's technical perspectives are well-represented and effectively integrated into global collaborative efforts.

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3.4 INTERNATIONAL ENGAGEMENT: WEBINARS AND CO-CREATION WORKSHOPS (2025-2026)

This section outlines the preliminary schedule, themes, and stakeholder focus for key international engagement activities planned under WP5 and coordinated with WP6. The activities aim to foster cross-border collaboration, standardization dialogue, and co-creation in alignment with OPENVERSE objectives.

Date (Tentative)	Activity Type	Title	Target Stakeholders	Expected Output
August 2025 (Q3)	Webinar	Open Standards for the OPENVERSEOPENVERSE: Engaging with W3C & Khronos	W3C, Khronos, OMI, ETSI	Stakeholder feedback summary, invitation to collaborate on standard specs
November 2025 (Q4)	Webinar	Human-Centric Virtual Worlds: Ethics, Accessibility, and Inclusion	XR4Human, NGI, academic researchers	White paper on ethical principles for global XR governance
January 2026 (Q1)	Co-Creation Workshop	Digital Sovereignty and Data Governance in XR	Gaia-X, EU-India ICT, VRARA, OASIS	Draft guidelines for secure, compliant data exchange in virtual worlds
February 2026 (Q1)	Webinar	Future Collaboration and Sustainability Planning	All international collaborators	Summary report and roadmap for long-term engagement beyond project duration

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4 CONCLUSIONS

4.1 GLOBAL INITIATIVES AND STAKEHOLDERS

The report has identified and analysed key international standardisation bodies and initiatives crucial to the successful deployment and adoption of Virtual Worlds technologies. Major global standardisation organisations such as the **World Wide Web Consortium (W3C)**, **International Organization for Standardization (ISO)**, **IEEE**, **ITU**, **Khronos Group**, and **Open Metaverse Interoperability Group (OMI)** play pivotal roles in defining interoperable frameworks, promoting open standards, and shaping the global technical and ethical landscape for immersive technologies.

Complementing these are several influential industry-led initiatives, including the **Metaverse Standards Forum**, **XR Association (XRA)**, **ETSI**, **MPEG**, **Web3D Consortium**, **Open AR Cloud Association**, **Open Geospatial Consortium (OGC)**, **Industrial Internet Consortium (IIC)**, **Blockchain-based Standards Groups**, **OASIS Open**, and **VR/AR Association (VRARA)**. These bodies significantly contribute to practical standards implementation, policy advocacy, innovation support, and industry collaboration, providing valuable ecosystems for European stakeholders.

The EU-funded initiatives identified, such as **Next Generation Internet (NGI)**, **Web4.0 and Virtual Worlds Strategy**, **XR4ALL/XR4Europe**, **MEDIAVERSE**, **IVVES**, **AI4Media**, **CHARITY**, **XRECO**, **XR4Human**, **EUCloudEdgeIoT, TransMIXR**, **VOXReality**, **Digital Europe Programme**, **European Digital Innovation Hubs (EDIHs)**, and the **Gaia-X Initiative**, underscore Europe's robust commitment to leading digital transformation. These initiatives collectively promote innovation, facilitate SME engagement, and ensure the development of human-centric, ethically sound, and interoperable Virtual Worlds technologies.

Finally, initiatives specifically supporting international collaboration, including **NGI International**, the **EU-US Trade and Technology Council (TTC)**, **ENRICH**, **EURAXESS Worldwide**, and the **EU Global Gateway**, are essential channels enabling Europe to actively engage in global digital dialogues, strategic partnerships, and cooperative frameworks.

4.2 STRATEGIC SYNERGIES AND STRENGTHS

The analysis highlights significant synergies in strategic interests, collaborative innovation, and complementary strengths between the EU and its international partners. Shared commitments to digital sovereignty, data governance, open standards, and ethical innovation underpin robust partnerships that facilitate the joint development of interoperable Virtual Worlds. Continued active engagement in collaborative frameworks such as the EU-US TTC, NGI International, and Global Gateway initiatives can significantly enhance Europe's global leadership in digital technologies and standards development.

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4.3 PERSISTENT GAPS AND CHALLENGES

Nevertheless, the project faces notable challenges. Fragmentation in technological standards, regulatory divergences, geopolitical tensions, uneven participation from less digitally mature regions, and limitations in EU funding mechanisms pose significant hurdles to seamless international collaboration. Addressing these gaps will require sustained diplomatic efforts, focused policy dialogues, flexible funding arrangements, and inclusive participation frameworks.

4.4 OPPORTUNITIES FOR FUTURE ACTION

The report identifies substantial opportunities for Europe to leverage its strengths in global standard-setting, broaden market access for SMEs and startups, deepen R&D partnerships, and address global societal challenges. Enhanced digital diplomacy, coupled with strategic investment in global capacity-building initiatives, will enable the EU to further consolidate its position as a global leader in Virtual Worlds and immersive technologies.

4.5 COMMUNICATION AND COLLABORATION STRATEGY

Effective dissemination and stakeholder engagement have been recognised as critical components for achieving international impact. The outlined communication strategy emphasises clarity, targeted messaging, multi-channel dissemination, active stakeholder engagement, and regular feedback mechanisms. Timely execution of planned milestones, supported by clearly defined roles and responsibilities within the consortium, will ensure effective alignment with global stakeholders and maximise the project's international visibility and influence.

4.6 FINAL RECOMMENDATIONS

To ensure long-term sustainability and global relevance of the OPENVERSE outcomes, the project consortium should:

- Prioritise active involvement and strategic leadership in global standardisation initiatives and forums.
- Strengthen collaborative ties and build strategic partnerships with international stakeholders, particularly in key markets such as the US, Asia, and emerging economies.
- Address identified regulatory and technical interoperability gaps through targeted policy advocacy, enhanced diplomacy, and cross-border collaboration.
- Ensure sustained funding mechanisms and broader participation, particularly for SMEs and stakeholders from digitally developing regions.

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- Regularly review and adapt dissemination strategies based on stakeholder feedback, maintaining flexibility and responsiveness to the evolving global digital landscape.

In conclusion, the OPENVERSE project is strategically positioned to significantly influence the future development of Virtual Worlds globally. By addressing identified challenges proactively and seizing opportunities for international leadership, the EU can solidify its role as a central player in shaping a sustainable, inclusive, and interoperable global digital ecosystem.

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