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the European Union

PRESENCE

A toolset for hyper-realistic and XR-based human-human and human-machine interactions, PRESENCE

Grant Agreement n° 101135025

HE Call identifier: HORIZON-CL4-2023-HUMAN-01-CNECT

Topic: HORIZON-CL4-2023-HUMAN-01-21

Type of action: HORIZON Research and Innovation Actions

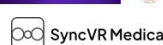
D6.1 Dissemination, communication, and exploitation strategy plan



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Grant Agreement n°: 101135025
 Project Acronym: PRESENCE
 Project title: A toolset for hyper-realistic and XR-based human-human and human-machine interactions

Lead Beneficiary: SOUND
 Document version: V1.2

Work package:
 WP6 – Impact Maximisation

Deliverable title:
 D6.1 **Dissemination**, communication, and exploitation strategy plan

Start date of the project: 1st of January 2024
 Contractual delivery date: 30th of June 2024
 Actual delivery date: 26 of June 2024

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¹ Dated from 1st of May 2025, the Unity's Digital Twin Professional Services -where WP5 Leader and the team developing PRESENCE Project were formerly affiliated- was transferred by acquisition to a different company, Capgemini, under the terms agreed between both institutions. The on-going amendment (not yet closed at the date of this deliverable submission) deals with the consortium endorsement to the termination of partner Unity Technologies Aps and the entry of partner Capgemini Engineering Deutschland S.A.S. & Co. KG.

CHANGE HISTORY

VERSION	DATE	PARTNERS	DESCRIPTION/COMMENTS
V0.1	14-03-2024	SOUND	Initial framework for D6.1 created
V0.2	21-03- 2024	SOUND	Framework D6.1 updated
V0.3	01-04-2024	SOUND	Start of market research
V0.4	19-04-2024	SOUND	First round of feedback on market research incorporated
V0.5	09-05-2024	SOUND, CERTH, INTER	Adding sections on exploitation, dissemination & communication, and standardization
V0.6	23-05-2024	SOUND	Completed market research
V0.7	10-06-2024	SOUND, CERTH, INTER	Sections on exploitation, dissemination & communication, and standardization
V1.0	14-06-2024	SOUND	Lay out finalized
V1.1	21-06-2024	SOUND, CERTH, INTER	Feedback from reviewers incorporated
V1.2	28-06-2024	SOUND, i2CAT	Finalization of document, formatting, submission to the EC through the Participant Portal



Executive summary

PRESENCE is dedicated to revolutionising human interactions in virtual environments by enhancing the concept of presence in eXtended Reality (XR) experiences through innovative technologies and interdisciplinary research. PRESENCE provides a versatile toolset that reshapes human interaction in virtual environments. Through its innovative technologies and interdisciplinary research, PRESENCE caters to diverse user needs, from professional collaboration to enhanced employee learning experiences, cultural heritage exploration and health therapy.

Whether you're a healthcare professional seeking innovative approaches to patient care, a company looking to enhance employee learning experiences, a team needing immersive professional collaboration tools, or adventurous travellers yearning for immersive virtual destinations, PRESENCE promises to transform the way you interact with digital environments and unlock new possibilities in XR technology.

PRESENCE's impact extends across diverse fields, from facilitating hands-on learning for trainees in manufacturing to offering therapists new avenues for stress and pain management through immersive therapy sessions. Museum curators can leverage PRESENCE to preserve and promote cultural heritage, engaging audiences with interactive XR tours and exhibits. Tourists can benefit from PRESENCE's ability to enrich their exploration, making historical experiences more immersive and accessible. By harnessing the power of XR technology, PRESENCE unlocks new dimensions of human interaction and immersion, shaping the future of digital engagement.

The current deliverable D6.1 presents the first version of the Dissemination, Communication, and Exploitation plan/strategy. D6.1 will present the reader with an overview and plan of the steps PRESENCE will take during the project's lifetime to (in)validate exploitation pathways and guarantee successful dissemination and communication of the project.

As such, D6.1 covers all current and future activities related to market analysis, exploitation, communication and dissemination, and standardisation. These 4 topics cover the four core sections of the deliverable you are currently reading.

The **section on Market analysis** provides the reader with a first overview of the current state and prospects of the Extended Reality (XR) industry in Europe. It begins by providing an overview of the key barriers that hinder the widespread adoption of XR, such as technical limitations, high costs, privacy concerns, and regulatory gaps. It also highlights the forces that enable XR growth, such as the rapid technological advancements, market dynamics, and cross-sectoral applications. It provides a comprehensive analysis of the European XR market, based on proxy indicators to assess whether the market aligns more closely with a projected baseline or a projected optimistic growth scenario of the XR market. In the analysis of the European XR market, it is concluded that the current market trends suggest a baseline scenario of steady growth, but with the potential to shift to the optimistic scenario if emerging trends such as AI integration and low-code development platforms are leveraged effectively.

PRESENCE's three SDKs—Holoportation, Haptics, and Virtual Humans—each have distinct processes and components within the XR value chain as they can operate independently. The Holoportation SDK adds value to the content capture and interface support segments by enabling real-time 3D video capture and transmission of human figures. The Haptics SDK adds value to the content capture, content processing, and interface system and support segments by simulating tactile interactions within virtual environments. The Virtual Humans SDK adds value to the content creation and content management and processing segments by creating sophisticated and interactive 3D models of humans for XR applications. From a business development perspective, this distinction between the different XR value chains of PRESENCE



is crucial. In the exploitation section, it will be further explored how each SDK offers unique value propositions (UVPs), which are distinct benefits that make a product attractive to customers by addressing their specific needs and preferences.

In the exploitation section it will be further explored whether each SDK offers different Unique Value Propositions UVP's for different customer needs.

The **section on Exploitation** outlines PRESENCE's strategy for developing a compelling value proposition and the framework for designing, researching, co-creating, and validating potential exploitation pathways, both jointly and individually. Six key components essential for successful exploitation, influenced by Human-Centred Design methodology, have been identified. These include market and customer analysis, creation of exploitation strategies, Joint Business Clinics, value proposition and commercial strategy development, IP management, and results consolidation with a user-centred approach.

Based on our market analysis, an initial Business Model Canvas has been formulated, pending validation during Joint Business Clinics and the upcoming Consortium Meeting. These insights will pave the way for the creation of a value proposition(s), which will steer exploitation activities in D6.2. Planned interactions with customers and the consortium, such as focus groups, Joint Business Clinics, user interviews, and individual exploitation plans, will utilize these insights to refine a compelling MVP definition in the upcoming period. This iterative process will enhance PRESENCE's exploitation options progressively over the years.

The **section on Communication and Dissemination** activities presents a comprehensive strategy for engaging diverse audiences through both online and offline methods. Key online tools include a well-structured website, active social media presence on LinkedIn, Instagram, YouTube, and X, and structured calendars for publications, events, and blog posts. Offline efforts involve event participation and promotional materials such as brochures and posters. Initial metrics show promising engagement, with plans to enhance reach and impact further. Continuous monitoring and adaptation of the strategy will ensure sustained momentum and successful promotion of PRESENCE's innovative XR technologies.

The **section on Standardization** highlights the project's contributions to different standardization bodies in three key areas: light field representations, haptics, and AI technologies(transversal). Partners are actively involved in relevant standardization groups and events, demonstrating their commitment to shaping future standards. To illustrate this, we provide details on these activities and upcoming participation as well as achievements such as the release of the MPEG Haptics reference software.

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Table of contents

- 1. Introduction to WP6 10
 - 1.1. WP6 KPI Tracking..... 10
- 2. Market Analysis 11
 - 2.1. XR Overview 11
 - 2.2. Barriers to XR adoption..... 12
 - 2.2.1. Technical Barriers 12
 - 2.2.2. Economic Barriers..... 13
 - 2.2.3. Societal & Ethical Barriers..... 14
 - 2.2.4. Addressing barriers to overcome 15
 - 2.3. Analysis of the European XR market 16
 - 2.3.1. XR market size and future projections 16
 - 2.3.2. Market implications for PRESENCE 19
 - 2.4. Virtual market breakdown 20
 - 2.5. XR customer segments and outlook 20
 - 2.6. XR value chain & business models for PRESENCE..... 22
 - 2.6.1. XR Value Chain..... 22
 - 2.7. PRESENCE value chain 24
 - 2.7.1. Holoportation SDK 24
 - 2.7.2. Haptics SDK..... 25
 - 2.7.3. Virtual Humans SDK 25
 - 2.7.4. Concluding remarks 26
- 3. Exploitation 27
 - 3.1. Methodology 27
 - 3.1.1. The Human-Centred Design process..... 28
 - 3.1.2. Feasibility, Desirability, and viability 29
 - 3.2. Exploitation components..... 30
 - 3.2.1. Component 1: market and customer analysis..... 30
 - 3.2.2. Component 2: creation of exploitation strategies 30
 - 3.2.3. Component 3: Joint Business Clinics..... 30
 - 3.2.4. Component 4: PRESENCE value proposition & commercial strategy 31
 - 3.2.5. Component 5: component & IP management 31
 - 3.2.6. Component 6: results consolidation with human-centred approach 31
 - 3.3. Market and customer analysis (component 1) 31



- 3.3.1. Market analysis 31
- 3.3.2. Customer analysis..... 31
- 3.4. Creation of exploitation strategies (component 2)..... 38
 - 3.4.1. Individual exploitation plans 38
- 3.5. Joint Business Clinic (component 3)..... 39
 - 3.5.1. The First Joint Business Clinic (JBC#1)..... 39
 - 3.5.2. The Second Joint Business Clinic (JBC#2)..... 40
 - 3.5.3. The third Joint Business Clinic (JBC#3)..... 40
- 3.6. PRESENCE value proposition & commercial strategy (component 4) 40
 - 3.6.1. Value Proposition Canvas..... 41
 - 3.6.2. Business Model Canvas..... 41
 - 3.6.3. PRESENCE key features..... 44
 - 3.6.4. The Minimum Viable Product..... 48
- 3.7. Component and IP Management (component 5)..... 49
- 3.8. Results consolidation with human-centred approach (component 6) 49
- 3.9. Capacity building and workshops..... 50
- 3.10. Concluding remarks on exploitation 51
- 4. Dissemination and communication 52
 - 4.1. Specific objectives..... 52
 - 4.2. The PRESENCE dissemination & communication strategy..... 53
 - 4.3. Communication tools..... 55
 - 4.3.1. Visual Identity..... 55
 - 4.3.2. Online tools 56
 - 4.3.3. Offline..... 58
 - 4.4. Timeline for communication and dissemination activities 59
 - 4.5. Online actions report..... 59
 - 4.5.1. Website PRESENCE 59
 - 4.5.2. LinkedIn..... 59
 - 4.5.3. Instagram 60
 - 4.5.4. X..... 60
 - 4.6. Offline action reports..... 60
 - 4.7. Concluding remarks on dissemination & communication..... 60
- 5. Standardization..... 61
 - 5.1. Relevant standardization groups..... 62
 - 5.2. Standardization planning..... 62



5.3. Concluding remarks on standardization..... 63

6. Annexes..... 64

Annex I: KPI Tracker 64

Annex II: PRESENCE personas..... 66

 II.i Professional collaboration 66

 II.ii Manufacturing Training 67

 II.iii XR Pain and stress relief..... 69

 II.iv XR for cultural heritage 70

Annex III: Individual exploitation plan 72

Annex IV: Component Tracker 74

Annex V: Business Model Canvas 80

 v.i Holoportation..... 80

 v. ii Haptics 80

 v.iii Virtual Humans..... 81

Annex VI: Publications calendar..... 82

Annex VII: Events Calendar 83

Annex VIII: Blog-Post calendar 84

Annex IX: Official Project Leaflet..... 85

Annex X: Call for participation template 86

Annex XI: Deliverable and slideshow templates 87

Annex XII: Website statistics 89

Annex XII: Standardization Tracker..... 90

7. Abbreviations and definitions..... 91

 7.1. Abbreviations 91

8. References 92

List of Tables

Table 1: Proxy indicators for market analysis 18

Table 2: Global headset sales volume..... 18

Table 3: European XR market Industry 2022..... 21

Table 4: Objectives of the PRESENCE JBCs 39

Table 5: Dissemination and Communication objectives 53

Table 6: PRESENCE Year 1 and 2 Dissemination and Communication timeline..... 59

Table 7: Standardization activities 2024 62

Table 8: PRESENCE Component Tracker 79

Table 9: PRESENCE Standardization tracker 90



List of Figures

Figure 1: XR Value Chain	23
Figure 2: PRESENCE methodology for user validation and exploitation	28
Figure 3: The 'sweet spot'.....	29
Figure 4: WP1 PRESENCE iterative process and milestones	37
Figure 5: Holoportation by i2CAT	44
Figure 6: Raw lightfield image.....	45
Figure 7: Reconstructed 2D image and 3D model	45
Figure 8: Volumetric reconstruction	45
Figure 10: Nova haptic glove by SenseGlove	46
Figure 9: Skinetic haptic vest by Actronika	46
Figure 12: Haptic Composer by Interhaptics &Razer.....	47
Figure 11: Unitouch Studio by Actronika.....	47
Figure 13: Example of virtual humans	47
Figure 14: The working of IVAs.....	48
Figure 15: PRESENCE's coordinator at ISIM workshop during IMX24	50
Figure 17: Logo PRSENCE	55
Figure 18: Logo variations	55
Figure 18: T6.1 KPI Tracking (table-form)	64
Figure 19: T6.1 KPI (visualised).....	64
Figure 20: T6.2, T6.3 & T6.4 KPI Tracking	65
Figure 21: Tracking of partners obligations.....	65
Figure 22: Persona Harry.....	66
Figure 23: Persona Hanna.....	66
Figure 24: Persona Daniel	67
Figure 25: Persona Max.....	67
Figure 26: Persona Karen.....	68
Figure 27: Persona Alex	68
Figure 28: Persona Maya.....	69
Figure 29: Persona Lucas.....	69
Figure 30: Persona Sarah.....	70
Figure 31: Persona Anna	70
Figure 32: Persona David	71
Figure 33: Persona Sophia	71
Figure 34: BMC Holoportation	80
Figure 35: BMC Haptics.....	80
Figure 36: BMC Virtual Humans	81
Figure 37: Publications calendar.....	82
Figure 38: Events calendar	83
Figure 39: Blog-Post calendar	84
Figure 40: Official Project Leaflet.....	85
Figure 41: Call for participation template	86
Figure 42: Deliverable template	87
Figure 43: Slideshow template.....	88
Figure 44: Website statistics and traffic trend	89



1. Introduction to WP6

The main objective of Work Package 6 (WP6) is to maximize the impact of the project through dissemination, communication, and exploitation. The process of identifying stakeholders, alongside pinpointing target audiences as well as relevant communities, falls within the scope of WP6. A significant emphasis of WP6 will be placed on conducting thorough market analyses, fostering innovation transfer, and developing collaborative exploitation strategies.

More in-depth, the WP6 objectives entail:

- Strategic and business guidance to consortium
- Problem-solution fit.
- Product-market fit.
- Business model fit.
- Outreach

These objectives described above are managed in four different Tasks:

T6.1 - **Dissemination & Communication** (M1-M36) [Lead: CERTH]

T6.2 - **Exploitation & Business planning** (M1-M36) [Lead: Sound]

T6.3 - **Communication, Community & Capacity-Building** (M1-M36) [Lead: Sound]

T6.4 - **Standardisation** (M4-M36) [Lead: INTER]

To ensure the successful exploitation of PRESENCE, the consortium has adopted a Human-Centred Design (HCD) approach that prioritizes the needs of its stakeholders and maximizes the impact of its outcomes. By adopting HCD, the PRESENCE consortium is committed to maximizing the impact of our project and ensuring our outcomes are aligned with the needs of the stakeholders. The exploitation plan comprises a clear strategy of specific activities, measures, and processes to be implemented in three phases. For further insights into what the human-centred design method entails for PRESENCE see Section 3.1 Methodology.

1.1. WP6 KPI Tracking

In a Horizon Europe project, tracking Key Performance Indicators (KPIs) within the Exploitation, Dissemination, and Communication work package is essential for multiple reasons. Firstly, it ensures that project outcomes and knowledge generated are effectively communicated and disseminated to relevant stakeholders, maximizing the project's impact and visibility. Additionally, KPI tracking allows for the systematic evaluation of the success and efficiency of exploitation strategies, helping to identify areas for improvement and optimization.

One of the primary advantages is **strategic alignment**. By continuously monitoring KPIs, the project can ensure that all activities are in sync with the overarching goals and objectives. This alignment is critical for the overall success of the project, as it helps in maintaining focus and coherence across various tasks and initiatives. It ensures that every action taken is contributing towards the desired outcomes.

Another significant benefit is **stakeholder engagement**. Effective KPI tracking facilitates targeted engagement with key stakeholders, fostering collaboration and partnerships. By understanding the needs and responses of different stakeholders, the project can tailor its communication and dissemination efforts to be more effective. This targeted approach not only enhances the project's reach but also builds stronger relationships with stakeholders, which can be beneficial for future collaborations and funding opportunities.

Impact assessment is another critical aspect enhanced by KPI tracking. By providing a quantitative basis for evaluating the project outputs, KPI tracking helps in demonstrating the value and relevance of the project. This assessment is vital for justifying the investment in the project and for securing



further support from funding bodies and other stakeholders. It also aids in reporting to the European Commission and other relevant entities, showcasing the tangible benefits of the project.

Lastly, KPI tracking enables **adaptability**. In the fast-evolving context of research and innovation projects, the ability to make timely adjustments to dissemination strategies is crucial. KPI tracking provides the data needed to understand when and where changes are necessary, allowing the project to adapt to new challenges and opportunities. This adaptability ensures that the project's communication and dissemination efforts remain effective and relevant throughout its lifecycle.

Within the Presence-project, we have adopted KPI-tracking with the use of PowerBI, a dedicated tool developed by Microsoft for visualizing data. We do our tracking on three levels (see Annex I: KPI Tracker):

- Due to the volume of KPIs, we have separated all the T6.1 Communication KPIs (both as a table and as a visualization),
- The KPIs for Tasks 6.2, 6.3 and 6.4 together comprise a second slide in the KPI reporting,
- Finally, we track certain progress markers by partners, considering that each partner committed to publishing 2 web-articles/blog posts and attending 2 events to represent Presence.

2. Market Analysis

Market analysis serves as an important method for acquiring an in-depth insight into a market, identifying its trends, and understanding the elements that contribute to its growth. Its primary purpose is to offer a clear view of the market's current and anticipated future conditions, pinpoint opportunities and challenges, and assess the likelihood of success for new products, services, or business ventures. With a thorough market analysis, businesses can make well-informed choices on resource allocation, marketing strategies, and how to secure a competitive edge. Whether you are looking to enter a new market, expand your business, or make strategic investments, market analysis is a critical step in the decision-making process.

The first part of this document is divided into two main sections. Initially, it provides a comprehensive overview of XR (Extended Reality), defining the concept and analysing its market trajectory across different regions. This part also investigates global trends affecting XR technology adoption, both positively and negatively. A closer examination of various market research reports offers a forecast of the XR market's overall size and the growth potential of specific segments relevant to PRESENCE.

Following this, the second section concentrates on Business Models and the Value Chain, applying the Value Chain analysis to evaluate PRESENCE as a business proposition. In this context, PRESENCE is introduced and examined within the framework of prevailing theories and discussions related to its market positioning and strategic potential.

2.1. XR Overview

Extended Reality (XR) is an umbrella term that refers to technologies that are used to create immersive experiences that blend the physical and digital worlds [Ref. 16]. Most notably, XR includes Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). These are three different technologies that merge digital content with the physical world:

- Virtual Reality (VR) puts users in a completely artificial computer-generated environment. It is a technology that tries to isolate its users from the physical world to create a sense of physical presence in a digital world. Virtual Reality is typically accessed through a headset that completely covers a user's visual field, simulating a physical presence in non-physical (digital) worlds.



- Augmented Reality (AR) does not completely cover a user's visual field, but rather overlays digital enhancements on the user's field of view. This can be in the form of images, videos and sounds. These types of content are then overlaid on real-world views, typically through smartphones or specialized headsets that have see-through glasses.
- Mixed Reality (MR) is a hybrid technology that merges the functionalities of Virtual Reality (VR) and Augmented Reality (AR). It refers to a virtual reality system intertwined with its real-world counterpart. MR covers the user's visual field with digital content (like a VR-headset would do), while simultaneously allowing them to see the real world via a camera system integrated within their field of view. Typically delivered through a specialized headset, MR facilitates the interaction between digital objects and the physical environment, allowing both to influence each other in real-time.

As XR technologies continue to evolve, driven by advancements in hardware and software, as well as increased digital infrastructure like 5G networks and data protection frameworks, they are poised to transform how we work, live, and interact [Ref. 4]. The ongoing development of XR promises not only to enhance current real-world applications, but also pave the way for new opportunities in remote collaboration, digital workflows, and environmental sustainability. To conclude, as XR technologies are maturing, they are expected to provide innovative solutions that adapt to and address the complexities of our rapidly changing world. In the forthcoming sections, the barriers that currently hinder widespread adoption of XR technologies will be explored, detailing the technical, economic, and societal challenges. Additionally, in section 2.4 the forces enabling XR growth will be discussed, highlighting how advancements in technology and market dynamics are shaping the future of XR applications.

2.2. Barriers to XR adoption

Despite its growing integration into various fields, XR technology is still confronted with several significant challenges [Ref. 27]. Based on preliminary interviews with industry experts, several key barriers have been identified that impede the widespread adoption of Extended Reality (XR) technologies. These barriers are categorized into technical, economic, societal, ethical, and policy-related challenges. Each category represents a significant hurdle that needs to be addressed to facilitate the broader acceptance and utilization of XR technologies.

2.2.1. Technical Barriers

One of the primary issues is enhancing the realism of XR environments to deepen 'user immersion'. User immersion refers to the degree to which a person feels engaged and absorbed in an XR environment, experiencing it as if they were physically present within that virtual space [Ref. 10]. Enhancing realism helps to suspend disbelief and increases the emotional and cognitive impact of the experience. In achieving this realism, XR technologies are often hindered by issues related to frame rate, resolution, and the accuracy of haptic feedback. This gap often prevents users from feeling completely immersed or connected with the virtual world. The effectiveness of XR applications for educational purposes, professional training, or entertainment is determined through realistic and real-time interactions [Ref. 11]. These applications rely heavily on the user's ability to suspend disbelief and engage fully with the virtual environment. For instance, the more realistic a simulation in a training scenario, the better it prepares individuals that train with XR for real-life situations [Ref. 11]. This increases the training's overall efficacy. Similarly, in the entertainment industry, increased realism can significantly enhance the enjoyment and engagement levels of the audience by making experiences more compelling and memorable. Bridging this gap is essential not only for user satisfaction but also for the broader adoption and success of XR technologies in mainstream applications.



One of the technical barriers is the frame rate of current XR devices. Within the XR industry this is called the uncanny valley. The uncanny valley refers to a situation in which something bears realistic human appearance (or movement), yet appears uncanny or repulsive to users because of a lack of real-time interactions [Ref. 12]. Furthermore, high frame rates are crucial to preventing motion sickness and ensuring smooth motion within the virtual environment, while high-resolution displays are necessary to provide clear and vivid visual content. The goal is to make XR interactions as natural and intuitive as possible, mimicking the fluidity and spontaneity of real-world interactions [Ref. 12]. As of 2024, XR technologies can sometimes still be laggy due to their frame rate and not as responsive as someone would expect from real-world experiences. When interactions in XR environments are seamless and intuitive, users are more likely to feel engaged and find the technology useful, whether they use it for learning, working, or playing. In professional applications, such as virtual meetings or remote collaboration, improved interaction quality ensures that users can communicate and work together more effectively. Therefore, addressing these challenges to enhance individual experiences is vital not only for PRESENCE but also for facilitating broader acceptance and integration of XR technologies into daily activities.

However, XR technologies face several other technical challenges that hinder their broader acceptance. One significant issue is the ergonomic design of XR devices; they are often bulky and heavy, making them uncomfortable for extended use, such as during surgical procedures or lengthy meetings and training sessions. This discomfort is compounded by the devices' limitations in image resolution and precision. For instance, in surgical applications, the accuracy of augmented reality (AR) hardware is critical— even a millimetre's deviation can lead to unsuccessful outcomes [Ref. 28]. Additionally, current AR devices may struggle with object detection under certain lighting conditions, impacting their utility in supporting individuals with disabilities.

The performance of XR devices, particularly head-mounted ones, is also limited by their processing speed and battery life [Ref. 15]. These limitations are exacerbated by the compact size of the devices, which restricts advanced operations. Connectivity issues, such as poor internet service, further impede the effectiveness of XR technologies, especially in mobile-based systems used for learning in healthcare education. Respondents of one survey have reported problems like slow response times and internet connectivity issues [Ref. 6].

2.2.2. Economic Barriers

Despite the declining prices of XR hardware, the creation of customized software remains a considerable expense. Developing personalized XR applications requires specific expertise in programming, 3D modelling, and other technical skills, substantially increasing the costs for users seeking to adopt XR technologies. Moreover, the ongoing need to gather data for testing and improving XR solutions exacerbates these costs [Ref. 2].

In the healthcare sector, for instance, costs can range dramatically, with professional VR exposure therapy platforms costing between EUR 1,200 and EUR 10,000 annually, excluding equipment². Similarly, in education, the costs of equipping classrooms with XR devices and the necessary software, often based on per-student subscriptions, are considerable. This is exacerbated by the limited number of companies specializing in XR, which can drive up costs due to lack of competition.

Furthermore, the infrastructure costs associated with setting up and maintaining VR/AR systems—including devices, network connectivity, and physical infrastructure—are significant barriers in several industries. Delivering impactful VR simulations requires interdisciplinary teams, which in practice means high financial investments to start with XR. In a survey conducted by Knack et al. (2019) the lack of established funding for the development and research of XR technologies was also seen as a significant barrier [Ref. 13]. All in all, these costs can be prohibitive for individual consumers and businesses alike, particularly for small and medium enterprises (SMEs) that may see potential benefits but are hesitant to invest heavily without assured returns. Additionally, XR

technologies have yet to achieve deep market penetration, which further complicates the economic viability of investing in this space [Ref. 13].

2.2.3. Societal & Ethical Barriers

The adoption of Extended Reality (XR) technologies faces some societal and ethical barriers, stemming from varying levels of technology acceptance across different demographic groups and privacy concerns. Acceptance of XR technologies is influenced by age, tech-savviness, cultural attitudes, and digital literacy among other things [Ref. 7]. Older populations and individuals with lower digital literacy often perceive these technologies as overly complex or unnecessary, showing resistance that hampers integration into both personal and professional realms. This reluctance to change established behaviours and workflows further slows the integration of XR solutions.

Privacy concerns are very important to address for XR technologies. This is especially true for applications in for example healthcare, where sensitive personal data are involved. XR devices gather vast amounts of user data, which can lead to privacy issues if not managed properly. For instance, a single 20-minute VR session can generate around two million data points, capturing intricate details of a user's physical movements and biometric data [Ref. 29]. Such detailed surveillance extends not only to users but also to bystanders inadvertently caught by XR systems. Even if data is anonymized, users can be identified through the millions of data points generated by person dependent micromovements, which significantly complicates the ability to guarantee privacy [Ref. 2].

The ethical dimension extends beyond privacy. The immersive nature of XR can blur the lines between real and virtual, raising questions about user consent and the psychological impacts of extended exposure to virtual environments. The lack of clear legal standards for behaviour within XR platforms creates a grey area in terms of liability and user protection [Ref. 21]. Users and regulatory bodies are increasingly wary of how data is collected, stored, and used, necessitating robust security measures to protect personal information.

2.2.3.1. Policy and regulation barriers

Regulatory frameworks often struggle to keep pace with rapidly evolving technologies like Extended Reality (XR), particularly evident in sectors such as healthcare and education. In healthcare, the disparity between XR technology and existing policies is marked by issues in insurance compensation for XR treatments [Ref. 2]. Industry representatives have highlighted inconsistencies, such as compensations that cover only therapist time but not patient-led sessions, or policies favouring less costly but less effective treatments [Ref. 2]. This misalignment discourages the adoption of XR in healthcare settings, where hospitals cannot afford to cover XR treatment costs without adequate insurance support. Additionally, the process to certify XR as a medical device is cumbersome, heavily regulated, and costly, often taking over a year to complete. This lengthy and expensive certification process can significantly hinder the integration of XR technologies in medical practices.

In the education sector, the regulation of XR is similarly underdeveloped. Issues include the absence of clear rules and enforcement mechanisms concerning harassment within XR environments. Educational institutions face administrative hurdles, particularly around privacy, which slow the adoption of XR technologies. There is also confusion among XR firms regarding compliance with regulations such as the General Data Protection Regulation (GDPR), suggesting a need for more specific legal guidance tailored to the nuances of XR applications in education [Ref. 2]. The lack of clear guidelines on the use of XR technologies hampers integration into teaching and learning processes. This uncertainty can inhibit the use of XR technologies, as seen during the COVID-19 crisis when several German states restricted the use of international virtual platforms based on privacy concerns [Ref. 21].



Furthermore, there is a lack of official guidelines for public entities like universities on how to integrate XR in teaching, feedback, and assessments, as well as in curricula. Often, the training on XR technologies for teachers is handled by the companies selling these technologies rather than by educational authorities [Ref. 21]. This situation underscores a broader absence of strategy on the use of XR in education, limiting its potential impact on learning environments. Data protection and content rights management are critical areas needing clear regulations to foster a safe and fair XR ecosystem.

2.2.4. Addressing barriers to overcome

According to a 2023 European report on these barriers, a multifaceted approach to overcome the barriers related to XR technologies is essential for its success [Ref. 6]:

2.2.4.1. Technical solutions

Enhancements in device ergonomics and functionality are a crucial barrier to be addressed [Ref. 2]. This involves designing lighter and more compact XR hardware to increase comfort during prolonged use. Advances in display technology to improve image resolution and precision are also important, especially for applications requiring high accuracy. These improvements have the potential of enhancing the user experience of XR technologies. Furthermore, improving the processing power and battery life of XR devices through innovations like cloud computing and 5G technologies can enhance their performance and reliability. Advancements in technology to reduce motion sickness—such as better tracking systems, higher frame rates, and optimized user interfaces—will also play a role in improving user immersion.

2.2.4.2. Economic strategies

Reducing the cost of XR adoption involves both hardware and software aspects. Economies of scale achieved by increasing production and widespread adoption can lower hardware costs. For software, encouraging the development of open-source platforms and standardizing tools can decrease development costs and foster innovation [Ref. 2]. However, it is important to note that the appearance of open-source platforms could also decrease the risk-acceptance of potential investors in XR technologies, because this can have an impact on the potential profitability. This can be countered by subsidies, grants, or tax incentives from governments, which can help lower the entry barriers for small and medium enterprises (SMEs) and educational institutions looking to invest in XR technology [Ref. 34].

2.2.4.3. Societal and ethical engagement

Building trust in XR technologies is important for its adoption [Ref. 6]. This can be addressed by implementing stringent data protection measures, enhancing transparency around data usage, and establishing robust privacy safeguards. Investing in the development of a few different standard XR ecosystems, without causing fragmentation, is vital for enriching the content side of the XR landscape [Ref. 2]. Additionally, promoting the use of authoring tools and libraries can lower entry barriers for new content creators, diversifying the types of applications available and fostering a more vibrant XR community.

2.2.4.4. Policy and regulation improvements

Addressing privacy concerns involves establishing and enforcing strict data protection regulations on a supra-national level by the EU to safeguard user information [Ref. 2]. Clear opt-in and opt-out choices must be provided, allowing users to control what data is collected and how it is shared. Regulatory bodies need to update and adapt policies to keep pace with XR technological advancements. An example where this importance is evidently impacting the adoption of XR technologies is in crafting clear and fair insurance compensation policies for XR treatments in



healthcare and creating comprehensive guidelines for XR integration in various industries [Ref. 2]. Furthermore, simplifying the certification process for XR as for example a medical device without compromising on safety and effectiveness can accelerate its adoption in clinical settings. By addressing these barriers through a multifaceted approach, the transformative potential of XR technologies can be unlocked across various sectors including manufacturing, healthcare, education, and beyond. The convergence of improved technology, economic incentives, ethical practices, and supportive policies will pave the way for a more integrated and widespread adoption of XR technologies. If these barriers are to be taken away, the user experience of XR will drastically increase. Ensuring the broad acceptance and integration of XR technologies will require persistent efforts in innovation, regulation, and public engagement.

2.3. Analysis of the European XR market

This section provides a comprehensive overview of the current European XR market, examining its size, structure, and future projections while highlighting the role of various market segments in driving growth and innovation. The analysis integrates findings from market reports, including reports by Ecorys from 2021 and Report Ocean from 2022. First these findings will be discussed, after which this market analysis will turn to qualitative data points to provide the most up to date analysis of the XR market in Europe.

2.3.1. XR market size and future projections

The European XR market can be categorized in both horizontal and vertical dimensions. Horizontally, XR technologies are made for various industries, enhancing different processes and experiences. Vertically, the market is analysed based on the contributions of different providers in the technology stack—from hardware and software to service delivery.

According to the 2022 Market Report by Report Ocean, the total European XR market (consisting of both the horizontal and vertical dimension) was valued at approximately €7.95 billion in 2021 [Ref. 26]. Note that this valuation is based on revenue generated by companies providing XR solutions and services in the European market. A significant portion of this revenue comes from companies based in the US or Asia. This valuation roughly aligns with other market research forecasts [Ref. 8]. The most important conclusions from these forecasts are the suggested growth potential of XR. Despite a slight decrease in the expected compound annual growth rate (CAGR) compared to earlier projections, the XR market continues to expand. According to Report Ocean this growth is driven by technological advancements and the increasing adoption of XR across various sectors. The influence of emerging trends, such as the metaverse and AI, is projected to catalyse further growth. Although the Report Ocean does not provide a specific forecast for the European XR market size by 2025, it predicts that the global XR market could reach approximately €62,3 billion in that year. Looking further ahead, by 2030, the total XR market could surge to approximately €160,9 billion, profoundly affecting sectors like academic virtual learning, e-commerce, advertising, and gaming.

As we advance into 2024, it is essential to reassess the projections made by the market reports from 2022 and 2021, particularly in absence of an accessible and comprehensive XR market analysis. This reassessment will provide deeper insights into the current market realities and emerging trends within the European XR landscape. One of the most notable findings of the last available Ecorys report is the dual impact of the Covid-19 pandemic and how it shaped the current XR market in Europe. Initially, the pandemic stalled investments and dampened market growth; however, it also catalysed the adoption of XR technologies. This surge was primarily driven by the increased demand for virtual solutions across media, tourism, and e-commerce sectors during prolonged lockdown periods. While this push has introduced XR to a broader audience, translating this into sustained growth has been largely unsuccessful [Ref. 8].

Based on this dual impact, the Ecorys report presented two potential growth scenarios for the European XR market by 2030: the baseline scenario and the optimal scenario. In the baseline scenario, the European market size of XR is projected to reach approximately €35 billion, reflecting



gradual but steady growth influenced by current technology adoption rates and market maturity. However, Ecorys also provided a forecast for an optimistic scenario. This scenario suggests a potential market size of about €65 billion in 2030. The optimistic scenario is based upon achieving multiple technological breakthroughs and market penetrations ahead of current expectations. It is important to note that both forecasts envision a growth for the European XR market, the difference is in the expected growth rate.

In the absence of up-to-date comprehensive European market reports, our analysis utilizes qualitative data points to conclude whether current market trends align more closely with Ecorys' baseline or optimistic scenario. To do this, the following proxy indicators for will be analysed to provide an understanding of market dynamics:

- **Technological Advancement:** Advances in XR technology, encompassing both hardware and software, play a critical role in driving the market's growth [Ref. 22]. The introduction of new products and technological breakthroughs by key industry players provides valuable insights into the pace of innovation within the XR sector. A consistent stream of incremental technological improvements aligns with the baseline growth scenario, indicating a steadily growing market. Conversely, rapid and significant advancements, especially in hardware capabilities and user interfaces, suggest a shift toward the optimistic scenario, signalling a market ripe for broader adoption and more complex applications. Technological advancement is an essential indicator of market health, as it directly influences user demand by enhancing the overall experience and expanding the capabilities of XR technologies.
- **AR/VR Headset Sales:** This indicator reflects consumer and business adoption of XR technology. A rapid increase in headset sales points toward a growing market, aligning with the optimistic scenario outlined by market analysts. On the other hand, if sales are more stagnant or declining, it may indicate that the market's growth is closer to the more conservative baseline scenario. While headset sales provide a clear indication of market activity and consumer interest, they should be analysed in conjunction with other data points to gain a comprehensive understanding of the market's development.
- **Integration of AI in XR:** The extent to which AI is integrated into XR applications can significantly influence market growth [Ref. 23]. Gradual improvements in AI, that enhance existing XR functionalities, suggest a market evolving in line with the baseline scenario. However, transformative applications of AI that introduce novel XR innovations or significantly enhance user experience point toward an optimistic growth trajectory. The impact of AI on the XR market's expansion depends on the relevance and effectiveness of the AI-driven features. Innovations need to address real user needs and provide tangible improvements to user experiences to positively influence market growth.
- **No-Code/Low-Code Development Platforms:** The emergence of no-code and low-code development platforms is transforming the XR content creation landscape, significantly lowering barriers to entry for new developers [Ref. 1]. This democratization of technology is important, because it enables a broader range of creators to participate in the XR market. In an optimistic scenario, these platforms could catalyse a rapid increase in the diversity and volume of XR applications, potentially revolutionizing the market. However, the impact of these platforms will largely depend on the quality and relevance of the generated content. High-quality, engaging, and useful XR applications will likely drive market growth, whereas a proliferation of low-quality content could undermine the market's value proposition.

Table 1 summarizes the alignment of each proxy indicator with the baseline or optimistic scenario:

<i>Proxy indicator</i>	Baseline Scenario	Optimistic scenario
<i>Technological advancements & product launches in 2023</i>	✓	
<i>Global AR/VR Headset Sales</i>	✓	
<i>Integration of AI into XR</i>	✓	✓

<i>Proxy indicator</i>	Baseline Scenario	Optimistic scenario
<i>Low-code Content Development and Ecosystem Expansion</i>	✓	✓

Table 1: Proxy indicators for market analysis

The analysis of the proxy indicators suggests that the current state of the XR market is more closely aligned with the baseline scenario projected in the Ecorys report. The reasons for this alignment are discussed in detail for each proxy indicator in the section below:

In 2023, the European XR market experienced a few notable technological advancements that suggest a steady, rather than explosive, growth in line with the baseline scenario. Apple's entry into the XR market with the Apple Vision Pro is a signal of that market's potential and readiness for mainstream adoption. The introduction of the Apple Vision Pro suggests an endorsement of the XR technology's viability and growth potential. It serves as a validation of the market's growing maturity [Ref. 9]. However, the price of the Apple Vision Pro of \$3,499 indicates that the device is not aimed at the general consumer market but rather at developers and a select group of enthusiasts.

This cautious approach aligns with a pattern of strategic development and gradual market expansion. Similarly, other notable product releases, such as HTC's Vive XR Elite and Sony's PlayStation VR2, have contributed to incremental improvements in the XR landscape. Meta's introduction of Quest 3 and AR glasses, priced competitively, further supports broader business and consumer engagement but still within the steady growth framework of the baseline scenario [Ref. 3]. These collective developments from key industry players indicate a year of significant but evolutionary changes, emphasizing sustained growth and technological refinement.

In 2023, the global AR and VR headset market showed a trend more aligned with the baseline scenario from the Ecorys report, rather than the optimistic growth previously anticipated. Notably, VR headset sales even decreased with shipments dropping to 6.97 million units from 8.30 million in 2022 within the EU [Ref. 31]. For a visualisation, see table 2 below. These sales suggest that the market is stabilizing or waiting on new technological breakthroughs. This shift indicates a movement towards a more sustainable growth rate after the initial surge in sales from 2020 to 2021. Meanwhile, AR headset sales remained steady, with around 0.78 million units sold. These sales have been consistent with the past two years, reflecting a gradual adoption rate that fits a baseline growth model. The current trend suggests that the market is maturing, where a slowdown in growth rates signals a phase of stability and ongoing but moderate growth. All in all, this proxy indicator suggests that the European XR market is closer to the baseline scenario.

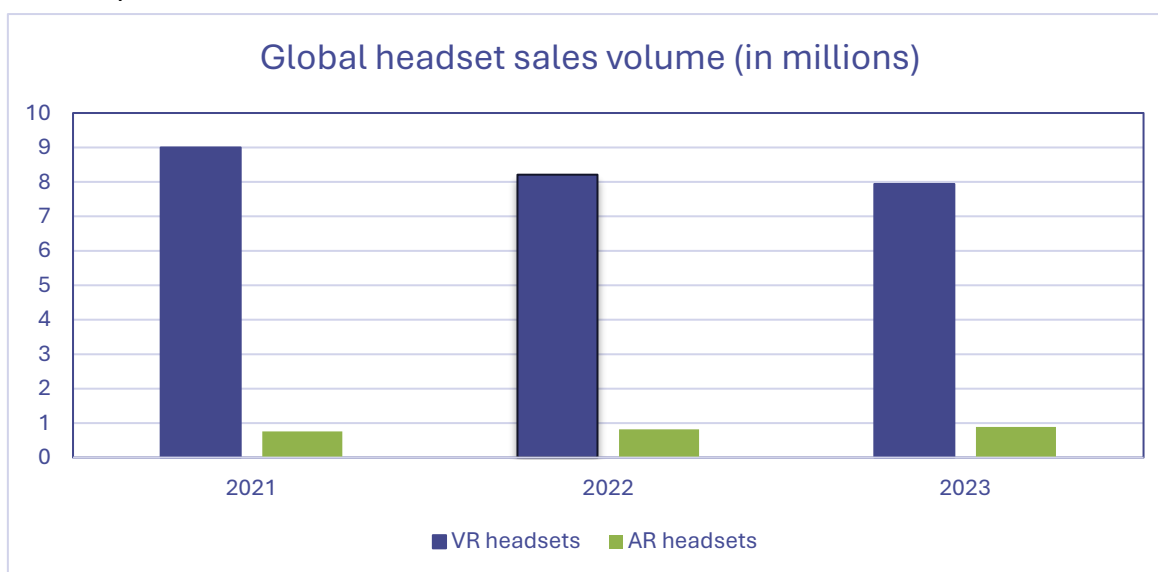


Table 2: Global headset sales volume



The third proxy indicator is the integration of Artificial Intelligence (AI) into Extended Reality. Over the past year, this integration illustrated the increasing sophistication of XR technologies by blending everyday use cases with advanced (generative) computing capabilities. Notable developments such as Meta's collaboration with Ray-Ban on AI smart glasses underscored AI's role in making XR devices more intuitive and seamlessly integrated into daily activities [Ref. 25]. This gradual integration suggests alignment with the baseline scenario in the Ecorys report, indicating a steady, evolutionary growth rather than sudden, market-transforming advances. However, the potential of AI to radically enhance XR experiences—by personalizing interactions and enriching user environments in sectors like education and healthcare—positions AI as a technology to look out for [Ref. 25]. AI might eventually catalyze a shift towards the optimistic scenario. If AI enables transformative applications of XR, it could lead to a significant expansion in market scope and scale. Thus, while current AI integration in XR aligns with more conservative growth estimates, its revolutionary potential remains a catalyst that could eventually steer the market towards the projected optimal scenario by Ecorys.

The fourth and final proxy indicator of this market analysis is the availability of no-code and low-code XR platforms. The rise of these platforms lowered the barriers to creating XR content over the past year. Platforms such as CoSpaces and Unity's XR Interaction Toolkit enhance the industry's accessibility and diversification [Ref. 20]. These platforms have enabled even non-technical users to create immersive experiences, thereby democratizing XR development and expanding the technology's reach and applicability. This evolution is important in industries like education, healthcare, and media, where there is a scarcity of skilled XR and 3D developers. The democratization suggests alignment with the baseline scenario, where gradual market expansion is anticipated through increased accessibility and a broadening of the user and creator base. However, the potential of these platforms to spur a wave of creative and diverse XR applications could also point towards a shift to the optimistic scenario. Thus, while the current state of low-code and no-code XR development supports a baseline scenario of steady growth, its capacity to foster significant market changes could eventually lead to more dynamic and expansive developments characteristic of the optimistic scenario.

2.3.2. Market implications for PRESENCE

As stated, the analysis suggests that the European XR market, as of now, predominantly aligns with the baseline scenario. This scenario forecasts a stable and growing market, favorable for entities preparing to enter or expand within this space. For PRESENCE, alignment with the baseline scenario is beneficial. Since PRESENCE is not yet ready to be released to the market and will be launched in two years, a market environment characterized by steady growth and stable dynamics is preferable. The current market conditions allow more time for PRESENCE to align its offerings with market needs and to enter a more mature and stable market.

In the forecasted baseline scenario of Ecorys, the total market value of the European XR industry is expected to increase to around €35 billion by 2030, and directly create employment for some 440,000 people. The wider supply chain impacts are also expected to indirectly increase production value, generating an additional 780,000 jobs [Ref. 8]. This forecast still presents an opportunity for growth and employment, offering a stable and growing market for new entrants like PRESENCE. The potential for transitioning towards the optimistic scenario exists and is anchored in the democratization of XR content creation and the personalization capabilities afforded by AI. These factors could eventually catalyze a shift towards more rapid growth and market diversification.

In conclusion, while the XR market currently exhibits characteristics of the baseline scenario, monitoring emerging trends such as AI integration and the expansion of low-code development platforms is essential. These trends hold the potential to propel the market towards the growth and innovation envisaged in the optimistic scenario. Stakeholders should remain adaptable to leverage these evolving dynamics effectively.



2.4. Virtual market breakdown

Building on the understanding of the current market conditions, it is useful to delve deeper into the specific segments that constitute the XR market. Understanding the production of XR services and solutions for both private and business customers require a detailed breakdown of the market. By examining these vertical segments, we can better comprehend the market in which PRESENCE will operate. This segmentation is based on the European XR report by Visionary Analytics in 2023 and reveals how different sectors like content creation, distribution platforms, authoring tools, and hardware development contribute to the ecosystem:

- **Content-based Services:** This segment focuses on the end-user experiences tailored for specific applications, such as remote surgery support or immersive gaming experiences. It highlights the direct interaction between XR technology and its users, emphasizing the importance of content in driving user engagement and adoption.
- **Distribution Platforms:** These platforms play a critical role in delivering XR content to users. While some platforms are generalist, supporting a wide range of digital content, others are specialized for VR/AR, offering tailored services that enhance the user experience in immersive environments.
- **Authoring Platforms:** Essential for the creation of XR content, these platforms provide the tools needed for developers to build engaging and interactive XR applications. They are crucial for productivity and innovation within the XR content development process.
- **Devices and SDKs:** At the core of the XR experience are the devices themselves, which range from head-mounted displays to more complex sensory equipment. The development kits (SDKs) provided with these devices enable developers to create applications that are optimized for specific hardware, ensuring that the end-user experience is as immersive and seamless as possible.
- **Device Components:** The individual components that make up XR devices, such as specialized screens and tracking devices, are foundational to the functionality and effectiveness of XR technology.

Each of these market segments is interconnected, with developments in one area influencing the others. For example, advancements in authoring platforms can lead to richer content offerings, which in turn drive the need for more capable distribution platforms and sophisticated devices.

2.5. XR customer segments and outlook

Having established a quick overview of a vertical breakdown of the XR market, it is important to understand the various customer segments that XR technologies serve. Namely because the XR market serves a broad spectrum of customer segments, each with specific needs and preferences. A 2022 report on the virtual and augmented reality industrial coalition argues that one of the biggest strengths of XR is its cross-sectoral potential and identifies the following notable sectors for XR in Europe: gaming, media & entertainment, retail, healthcare, manufacturing and military and defense [Ref. 14]. In the EU, the gaming sector dominates with a 29% market share, followed by media and entertainment at 19%, and retail at 15%. Healthcare, alongside military and defense and manufacturing, holds a smaller portion of around 10% of the market.

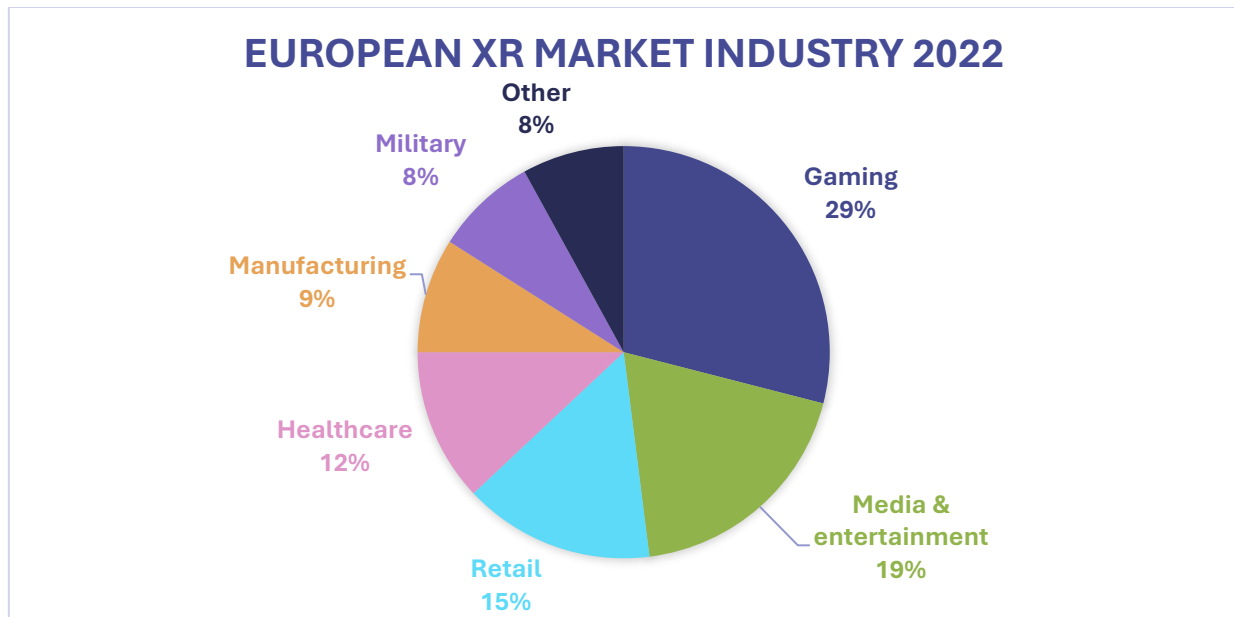


Table 3: European XR market Industry 2022

Despite the moderate growth across the XR market, certain industries stand out due to their rapid extension and growth forecast:

- **Gaming & Entertainment:** XR is having an increasingly big impact on both the gaming industry as well as the broader media entertainment industry by offering immersive experiences previously deemed impossible, significantly altering how consumers interact with (gaming) content.
- **Healthcare and Medicine:** In healthcare, XR improves patient outcomes and elevates the training and education of medical professionals through more interactive and precise simulations.
- **Education and Training:** XR is reshaping educational methodologies, making learning more engaging through gamification and practical by simulating real-world environments and scenarios.
- **Retail and E-commerce:** XR enhances online shopping experiences by providing interactive and personalized shopping experience.
- **Construction and Architecture:** in this industry, XR improves project visualization, design, and collaboration, facilitating better communication and decision-making among dispersed teams.

There is a broad consensus that a rising tide in the XR market will rise all boats. For example, an EU strategic paper confidently suggests that “*various sectors are trending upwards, and, in the future, more uptake is expected for social interactions and entertainment purposes.*” [Ref. 33]

PRESENCE, with its focus on enhancing XR applications through its core technological pillars—holoportation, haptics, and virtual humans—targets multiple key sectors of the XR market. It is important for PRESENCE to leverage technological advancements and monitor the current state of the XR market to address the challenges faced by its future users. However, its success will not only depend on XR’s market size and customer segments, but also establishing a solid business model that considers its users’ needs and addresses any barriers to growth. To achieve this, PRESENCE will be developed through a human-centred design approach. A viable business model can be developed based on the added value to the market and will be a critical factor in determining PRESENCE’s future success. The added value of PRESENCE is the topic of the following section.



2.6. XR value chain & business models for PRESENCE

While the market outlook for PRESENCE is promising, simply recognizing the potential of market growth for the XR sector is insufficient for its sustained success. To ensure that PRESENCE effectively delivers and captures the value it creates, it is crucial to develop a business model. Before developing such a model, it is beneficial to analyze the XR value chain to gain a deeper understanding of PRESENCE and the value it aims to create. Having a framework to analyze the options available helps decision-makers to make informed decisions on product and market fit. This strategic approach enables making informed decisions about market positioning and maintaining a competitive edge.

The concept of a business model in the context of PRESENCE revolves around how the company creates, delivers, and captures value in the XR market. This involves identifying the unique propositions PRESENCE offers, the customer segments it targets, and the revenue streams it capitalizes on. This is subject to the outline (see section 3.1XXX) -> WP6 Simultaneously, value chain analysis provides a methodical review of the activities within PRESENCE's operations. From R&D and content creation to platform development and user engagement, each segment of the value chain is analyzed to enhance efficiency, reduce costs, and leverage opportunities for innovation.

Both the business model and value chain analysis offer deep insights into PRESENCE's operational framework. They function as analytical tools to identify inefficiencies, optimizing processes, and discovering new avenues for value creation. This dual approach not only ensures that PRESENCE can effectively leverage its technological advancements but also helps in crafting strategies that align with evolving market demands. This will help PRESENCE to maximize its impact and achieve long-term sustainability and growth. To capitalize on these opportunities, PRESENCE must continue to innovate and tailor its offerings to meet the evolving needs of these sectors. The success of PRESENCE will depend on its ability to address the specific challenges faced by its users. Establishing a solid business model that reflects the needs of its users and adapts to market conditions will be crucial.

2.6.1. XR Value Chain

In his best-seller work in 1985, *The Competitive Advantage: Creating and Sustaining Superior Performance*, Michael Porter introduced the concept of the value chain, which outlines a series of activities that businesses in a specific sector perform to deliver valuable products or services to their customers [Ref. 24]. This framework has proven to be successful across various industries, from manufacturing to digital services. It helps enabling organizations to analyse their operations systematically to identify where value can be added.

The value chain model is equally applicable to the Extended Reality (XR) sector [Ref. 5]. It consists of six primary processes, which are grouped into two main categories: *Content Activities*, which are central to the creation and delivery of XR content, and *Support Activities*, which encompass the necessary digital infrastructure and hardware. This model helps stakeholders in the XR industry understand and optimize their operations to enhance value creation and explore new revenue opportunities.

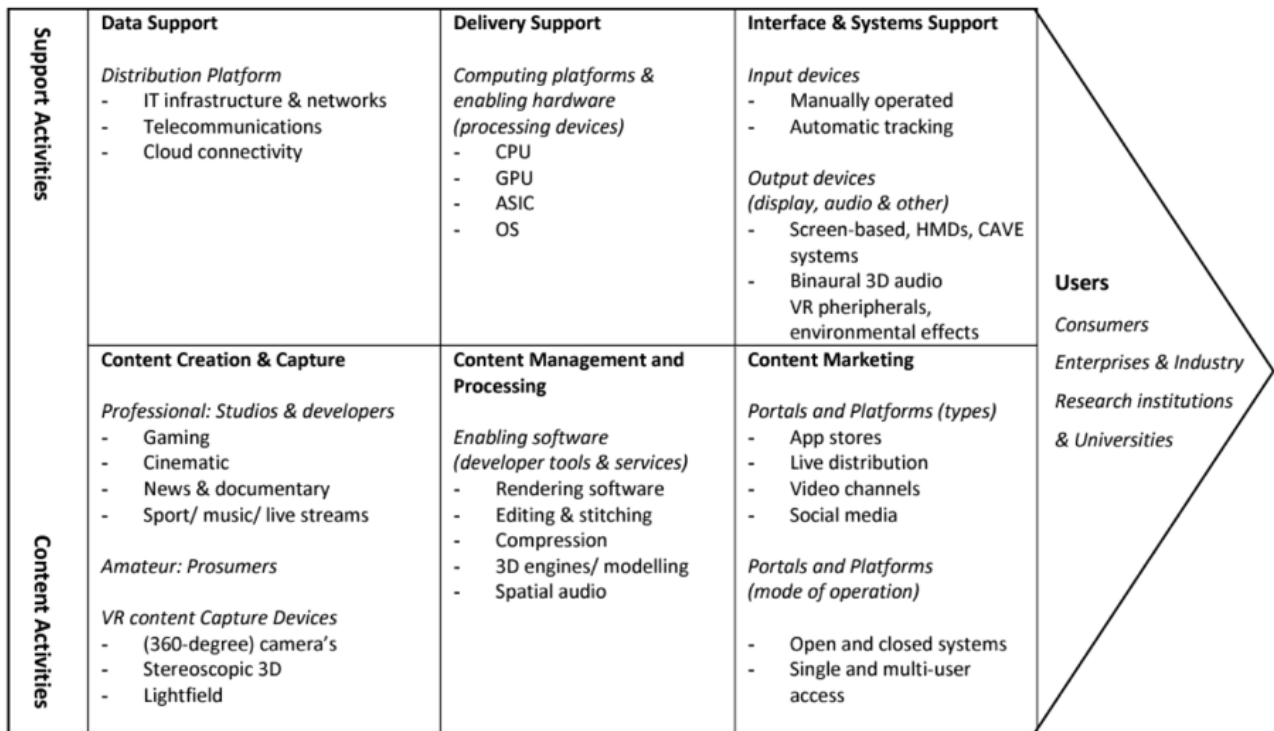


Figure 1: XR Value Chain

The content segment of the model consists of three core processes: content creation and capture, content management and processing, and content marketing.

2.6.1.1. Content creation and capture

The first way to add value in the content segment of the XR value chain is through generating original virtual reality content through two primary methods: content creation and capture. Content creation involves the digital design and production of materials using programming and animation techniques, while content capture involves recording real-world scenes through sensors, photography, or videography to integrate into virtual environments.

2.6.1.2. Content management and processing

Technological software that enables the conversion of sensor data, digital content and raw 360° footage into usable formats is crucial to ready XR content for distribution and mainstream usage. Firms can add value by post-production editing and reconfiguration of XR content. Based on the tasks that are performed and the technological tools and services that are implemented to do so, these processes can be divided into a few subclassifications. Content rendering, content stitching and editing, content compression, and content modelling all pertain to the visual content.

2.6.1.3. Content marketing

Firms involved in this step of the value chain act as market makers by providing user access through downloading or streaming services. Their primary tasks are to host, market, sell, and distribute content through various portals and platforms.

Looking at the *Support Activities* segment, digital infrastructures and services play a central role. The support activities segment of the framework consists of three core processes: data support, delivery support, and interfaces and systems support.



2.6.1.4. Data support

Firms pursuing these processes add value by providing the processing power and IT infrastructure and networks necessary to distribute XR content to end-users. Content distribution networks are a crucial layer in the overall ecosystem.

2.6.1.5. Delivery support

To facilitate user interaction with the digital content, firms that provide delivery support systems (e.g., computing platforms, supporting hardware) are required, enabling the experience to run smoothly. In addition to hardware support, payment support becomes particularly important when XR is implemented as a sales channel. The payment process must appear as a smooth and immersive VR experience to enhance virtual commerce.

2.6.1.6. Interfaces and systems support

This part of the model covers the technological components of delivery systems that enable user interaction with the digital content, either as an input device or output device.

2.7. PRESENCE value chain

In the development of PRESENCE, it is important to understand the value chain for each of the technological pillars in order to maximize the potential and impact of the tools developed. The three SDKs—Holoportation, Haptics, and Virtual Humans—each have distinct processes and components within the XR value chain as they can operate independently. This section analyses the value chain of each SDK to identify where they add value and analyse potential integration points.

2.7.1. Holoportation SDK

Holoportation is the first of three technological pillars within PRESENCE. This SDK is designed to facilitate real-time, three-dimensional, volumetric video capture and transmission of human figures across different locations. The technology will enable remote users to see, hear, and interact with each other in 3D as if they are physically present in the same space. Utilizing sophisticated cameras and sensors, the Holoportation SDK captures comprehensive depth and geometry data of a person or an object. This data is then processed and compressed using innovative techniques to allow real-time streaming over network infrastructures like 5G. The goal of this SDK is to achieve a high level of presence and realism, overcoming the limitations of traditional video communications.

The Holoportation SDK of PRESENCE is instrumental in the content capture and interface support aspects of the XR value chain. This technology focuses on:

- **Content Capture:** the SDK utilizes advanced camera systems to capture detailed volumetric video data. This involves recording real-world scenes using sophisticated sensors that can capture depth and detailed geometrical information. This is an essential process for creating realistic volumetric representations in XR environments.
- **Content Processing:** After capture, the volumetric data undergoes processing to convert it into a format suitable for real-time interactions. This includes compression, optimization, and real-time rendering techniques. This will ensure the data can be seamlessly integrated and used within virtual environments without excessive latency.
- **Interface & System Support:** The Holoportation SDK also acts as an interface component by processing the incoming data in a way that it can be interactively used in XR setups. It includes a camera as an input device, which data it processes. It supports a variety of output devices and ensures compatibility and scalability across different platforms and network conditions, enhancing the user experience by providing realistic interactive capabilities.



2.7.2.Haptics SDK

The Haptics SDK within PRESENCE is designed to simulate tactile interactions within virtual environments. It is aimed at enhancing the feeling of physical presence in a virtual environment through the sense of touch. This technology enables users to feel and manipulate virtual objects with realistic feedback, bridging the gap between digital and physical interactions. The SDK integrates cutting-edge haptic technology, including various actuators and sensors that provide a range of tactile sensations such as texture, pressure, and vibration. These components work together to capture user input as tactile data and convert it into perceivable haptic feedback, which is crucial for creating immersive and intuitive user experiences in XR. The Haptics SDK encompasses both device functionality and content processing within the XR value chain. It serves multiple roles:

- **Content Capture:** The Haptics SDK captures haptic content by registering physical interactions (e.g., touch, pressure) and translating them into digital signals that can be processed and replicated. This content capture is needed to develop content that involves physical interaction with the virtual environment.
- **Content Processing & Interface:** After capturing the inputs, the SDK processes this data to generate appropriate haptic feedback. This involves algorithms and systems that adjust the intensity, pattern, and type of tactile responses based on the interaction context within the virtual environment. It is essential for ensuring that the haptic feedback is not only timely but also accurately reflects the virtual scenario's physical properties.
- **Interface system & support:** The Haptics SDK plays a dual role in both input and output capacities. In comparison to the Holoportation SDK, it provides not only an input device that can process data, but also as an output device that can create data. It translates user inputs into responses that a XR system can recognize and react to. As a system support that has data output, it also delivers realistic tactile feedback through various output devices integrated into the user's gear, such as gloves, suits, or handheld controllers. This seamless integration of input and output functions supports a comprehensive and immersive user experience.

2.7.3.Virtual Humans SDK

The Virtual Humans SDK is aimed to create sophisticated and interactive 3D models of humans for XR applications. This SDK leverages advanced technologies such as artificial intelligence, machine learning, and detailed animation techniques to craft hyper-realistic virtual agents that can mimic human behaviours, expressions, and interactions with high fidelity. The SDK involves developing detailed mesh models, applying various textures, and implementing rigging techniques to ensure that virtual characters can move and interact in a realistic manner. To enhance the authenticity of these virtual humans, the SDK incorporates motion captured data and RGB-D video frames to model real human movements. This data is used to animate the virtual models, allowing their movements and expressions to closely mirror actual human behaviours. The SDK will create virtual humans that provide users with lifelike interactions that enhance the realism of the XR experience. The SDK's capabilities include generating detailed body animations, simulating natural body movements, and integrating responsive speech and behavioural patterns, making virtual interactions feel authentic and engaging. The Virtual Humans SDK primarily contributes to content creation and processing, focusing on the generation and management of interactive virtual agents.

2.7.3.1. Value chain analysis

- **Content Creation and Capture:** the SDK enables digital production through the use of Machine Learning and 3D animation techniques. This process encompasses the development of mesh models, the application of textures, and rigging techniques to ensure that virtual characters move and interact in a lifelike manner. the SDK comes with pre-trained models based on this training. Furthermore, to bolster the realism of these virtual humans,



the SDK integrates motion capture data that records real human movements. This captured data is needed to animate the virtual models so that their movements and expressions closely parallel real-life human behaviours. This seamless integration of created elements and real-world captured motions produces compelling and believable virtual agents.

- **Content Management and Processing:** Once created, these virtual humans undergo extensive processing to ensure they operate effectively within different XR environments. This includes real-time rendering adjustments to maintain visual fidelity and appropriate behavioural responses under various virtual conditions. The SDK's capabilities extend to generating animated gestures and dynamic responses to user interactions. The SDK also processes algorithms that enable virtual humans to exhibit physics-based plausible full-body movements, animated gestures, and dynamic responses to user inputs. The absence of an input/output device at the point of deployment makes this SDK essentially different from the other 2 SDK's of PRESENCE.

2.7.4. Concluding remarks

The value chain analysis of the PRESENCE's three SDKs reveals distinct paths through which each technology adds value to the extended reality (XR) experience. These SDKs, while operating independently, show both convergences and divergences in terms of their roles and impact within the XR value chain.

The Holoportation and Haptics SDKs are very similar from a business viewpoint since both contribute to the Content Capture, Content Processing and Interface system and support segments of the XR value chain. They employ advanced technologies to capture real-world data (Holoportation through volumetric video and Haptics through tactile interactions) and process this data to produce realistic and real-time interactions within XR environments. Both SDKs also play a dual role in serving as interfaces, handling input through their respective sensing technologies and delivering output through immersive feedback mechanisms. This close alignment in their operational stages underscores their complementary roles in enhancing the immersive experience by focusing on the fidelity and interactivity of the XR environment.

In contrast, the Virtual Humans SDK adds value primarily in the Content Creation and Capture, and Content Management and Processing segments. It leverages AI and machine learning technologies to develop highly detailed and responsive virtual agents. These agents are capable of mimicking human behaviour with high fidelity, which will improve user interactions through realistic and dynamic responses. Unlike the Holoportation and Haptics SDKs, the Virtual Humans SDK does not directly interface with hardware inputs and outputs. Instead, it creates a layer of content that is central to the narrative and interactive elements of the XR applications. Based on this analysis, it is hypothesized that each SDK offers a unique value proposition tailored to different customer needs. This hypothesis will be tested in the coming months leading up to the completion of D6.2.

From a business development perspective, this distinction is crucial. Holoportation and Haptics add value primarily through enhancing the sensory and presence aspects of XR, aligning more closely with sectors that focus on realism and immersive physical interaction, such as virtual meetings, remote collaboration, and advanced training simulations. This similarity in value addition points to potential synergies between these two SDKs, suggesting a strategic focus on markets and applications where high-fidelity sensory integration is important for the user experience. These SDKs are particularly well-suited for industries where the authenticity of the physical environment and the precision of user interactions play a vital role, such as in health, engineering, and virtual tourism.

On the other hand, the Virtual Humans SDK add a different value within the XR Value Chain. This SDK mainly adds value in the content creation and content management & processing segment. It is tailored for sectors that demand deep narrative engagement and sophisticated interaction models, such as entertainment, education, customer service and therapeutic scenarios. The development of the Virtual Humans SDK enhances the psychological realism of XR applications by enabling virtual agents to have meaningful interactions. These features not only improve the user experience by



providing more interactive and responsive virtual agents but also open new possibilities for XR applications that require high levels of psychological engagement [Ref. 6].

To strategically deploy these SDKs, it is imperative to leverage their capabilities to meet the nuanced demands of diverse XR applications. It is important to distinguish between the capabilities of the Holoportation, Haptics, and Virtual Humans SDKs. Whereas the Holoportation and haptics SDK's have similar value chains, the Virtual Human SDK is fundamentally different. Each SDK serves unique functions that cater to specific aspects of the XR Value Chain. Acknowledging and acting upon these distinctions allows for a more focused development approach. In section 3.1 it is further explored how PRESENCE can cater different types of user needs and wishes to ensure that each SDK is applied in contexts where its impact will be maximized. This not only enhances the efficiency and effectiveness of the technology but also increases the overall market potential of PRESENCE.

3. Exploitation

The PRESENCE exploitation strategy is designed to provide guidance to Consortium Partners for effective exploitation of the project results. In this section we provide the key components of the exploitation strategy.

The exploitation of research results is a vital link between innovation and societal impact. This chapter examines the methodology, strategic framework, and activities designed to optimize the utilization of project outcomes and ensure their seamless integration into markets, policies, and communities. The methodology is based on the Sound methodology for Human-Centred Design (HCD) [Ref. 32]. An exploitation strategy has been developed, encompassing six components aimed at realizing the project's objectives and maximizing their benefits for customers and markets through a people-centred design approach.

The plan outlines the creation of the exploitation strategy, detailing the characteristics of the Minimum Viable Product (MVP), the anticipation of current needs, and the pathways for commercialization and monetization. It also includes the organization of the first Joint Business Clinic and the utilization of its results to validate or invalidate the value proposition.

The subsequent section will describe the exploitation activities planned for the duration of the project to further develop and validate the PRESENCE exploitation strategy.

3.1. Methodology

This section focuses on the methodological underpinnings of exploitation within PRESENCE. Here, we will look at the design and business approach and tools of the PRESENCE exploitation methodology.

The strength of any design project lies in ensuring that the design process remains flexible and responsive while prioritizing users and their needs. By continuously reviewing and revising the product based on user feedback and practical testing, the process will yield products that resonate deeply with the intended users. This approach ensures that the products remain human-centric and adaptable to evolving needs and preferences, increasing the likelihood of success-outcomes and decreasing product-market failure risks.

To maintain flexibility and responsiveness in the design process, Design Thinking employs a cyclical methodology consisting of five key steps: empathize, define, ideate, prototype, and test. This cycle is both dynamic and iterative, consistently producing human-centred products by encouraging designers to consider both internal and external perspectives. Initially, designers empathize with users (external), then conceive solutions and create prototypes (internal), followed by testing with users to gather feedback (external). This loop can be repeated multiple times, facilitating incremental improvements to the product or service. This iterative nature substantiated the concept of an infinite loop in Design Thinking.

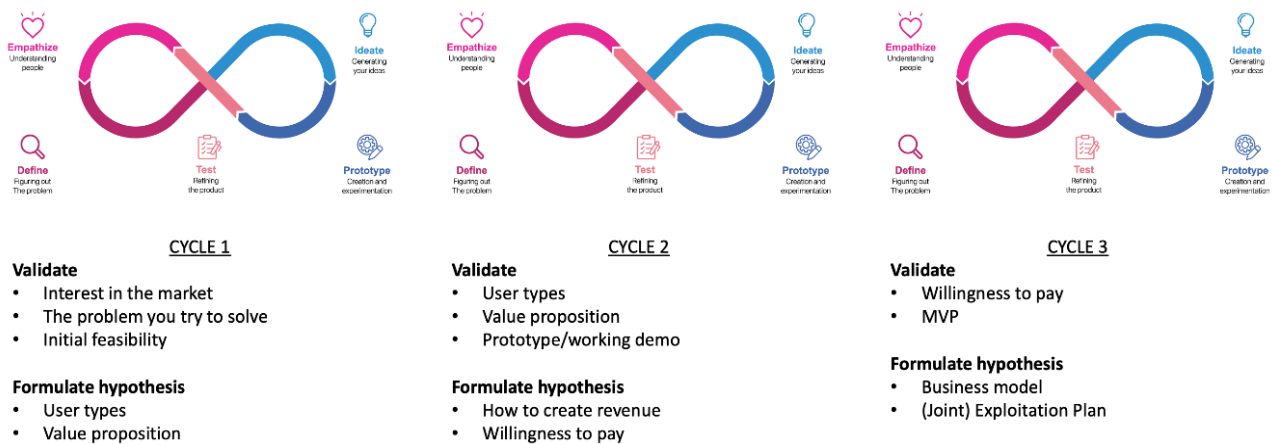


Figure 2: PRESENCE methodology for user validation and exploitation

The methodology for user validation and exploitation of PRESENCE comprises three cycles, each lasting 10 months (see Figure 2: PRESENCE methodology for user validation and exploitation), followed by an additional 6-month period dedicated to result consolidation (see Section 3.8 Results consolidation with human-centred approach (component 6)). During this period, activities include contacting and contracting launching customers and strategic partners, creating use and business cases for potential launching customers, and establishing further strategic alliances and partnerships.

Each cycle concludes with a user co-creation event, known as the Joint Business Clinic. There are three Joint Business Clinics in total, each with two primary objectives: validating existing assumptions and formulating new hypotheses based on insights gained, which will then be analysed and validated.

3.1.1. The Human-Centred Design process

The PRESENCE methodology and exploitation process have been significantly shaped by Human-Centred Design (HCD). The following section provides a concise overview of the implications of HCD for PRESENCE's Work Package 6 (WP6).

HCD emphasizes co-creation, a process where solutions are co-designed with users rather than for them. This approach enables PRESENCE to leverage the knowledge and creativity of its target segments, fostering the development of solutions and services that are more likely to be adopted and utilized. Below is a summary of the main implications of HCD;

- **User-focused:** HCD begins with a deep understanding of users' needs, wants, and experiences. At PRESENCE, we strive to identify the problems and challenges faced by users and create solutions that effectively address these issues.
- **Collaborative process:** HCD involves collaboration among stakeholders, including users and consortium members. This collaboration manifests through interviews, focus groups, and joint business clinics, ensuring that the designed solutions genuinely meet the needs of their intended users.
- **Iterative approach:** HCD is characterized by its iterative nature, involving continuous testing and refinement. PRESENCE will develop multiple value propositions, testing each with users to gather feedback and make necessary improvements, thereby ensuring the final solution is optimal for users.
- **Empathy:** A fundamental component of HCD is empathy. PRESENCE aims to understand users' perspectives, emotions, and motivations to create solutions that are meaningful and relevant to them.



- **Inclusivity:** HCD seeks to create solutions that are accessible and usable by a diverse range of individuals, including those from different cultural backgrounds and with varying levels of experience and expertise.
- **Holistic view:** PRESENCE's HCD approach takes a comprehensive view of the problem and users' needs, considering not only immediate requirements but also the broader context in which the solution will be used and its potential impact on users' lives.
- **Evidence-based:** HCD relies on data and user feedback to inform design decisions, ensuring that the solutions developed are effective and meet users' needs.

The facets of HCD discussed above are integral to the exploitation steps outlined in Section 3.2 Exploitation components. While these principles may not be explicitly stated, they are embedded in every aspect of WP6 and the activities stemming from this work package.

3.1.2. Feasibility, Desirability, and viability

To be confident that PRESENCE is designed to meet the needs of its future users, it is essential to consider three key factors: feasibility, desirability, and viability. These factors guide the development and iteration of the innovative solution to align with customer and user requirements. Satisfaction of all three key factors is desired, if the factors are satisfied the so called 'sweet spot is found.

Feasibility pertains to the technical and practical aspects of the XR media ecosystem. This involves ensuring that the solution can be realistically developed and deployed within the constraints of current technology, resources, and other limitations. Desirability focuses on the user-centred aspects of the XR media ecosystem. It emphasizes meeting the needs and wants of the intended audience, including features, user experience, and overall value. Viability addresses the business aspects of the XR media ecosystem. This includes financial sustainability, revenue generation potential, and alignment with the overall business strategy and objectives.

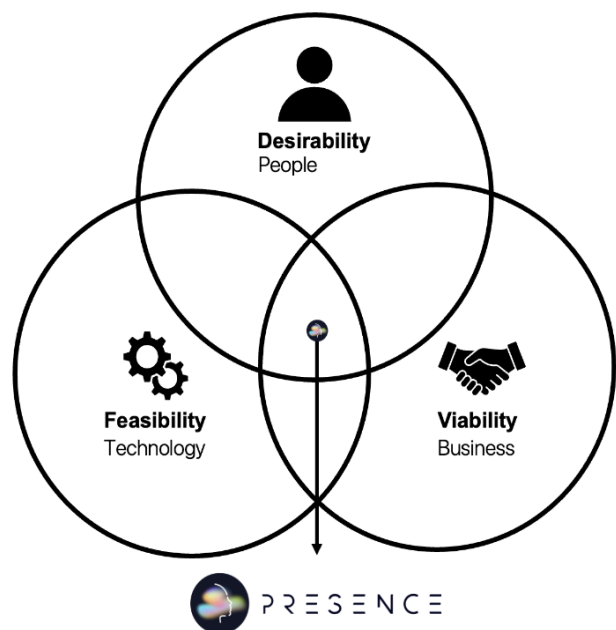


Figure 3: The 'sweet spot

To ensure that PRESENCE remains a human-centred solution, the project members will continually consider the following questions:

- **Desirability:** Are we solving the right pain points?
- **Feasibility:** How can we build PRESENCE to make our product/service healthier and stronger?
- **Viability:** Does our business model fit with the way PRESENCE customers want to use and pay for our solution?

PRESENCE employs several methods and tools to assess the feasibility, desirability, and viability of the solution. These include user research and testing, market research, and prototyping. User research and testing is vital for evaluating desirability. It allows the team to gather user feedback and make informed decisions about the value proposition and services. Market research is used to assess viability by determining market demand and analysing competition. Prototyping, primarily



conducted during Joint Business Clinics (see Section 3.5 Joint Business Clinic (component 3)), is a valuable method for assessing both feasibility and desirability, as it enables testing and refinement of business models.

By integrating these approaches, we ensure a balanced and comprehensive strategy that aligns with the technical, user-centred, and business requirements of PRESENCE.

3.2. Exploitation components

This section provides a concise overview of the exploitation components specifically defined and implemented by the PRESENCE project to maximize the utilization of results generated throughout its duration. The execution of these steps will be supported by communication activities carried out by the dissemination team (see Section 4 Dissemination and communication), as well as one-on-one demonstrations with prospective stakeholders.

The following components have the objective of developing an integrated strategy for exploiting project results both individually and collaboratively. These components are often interrelated and mutually influential in practice. Consequently, the outcomes described for each component in this deliverable frequently intersect with those of other components. Thus, the subsequent exploitation components should be viewed as contributing collectively to the creation of comprehensive (joint) exploitation strategies rather than as discrete entities with rigid boundaries.

3.2.1. Component 1: market and customer analysis

Aligned with the HCD methodology, the initial step in the exploitation strategy entails conducting a thorough analysis of the current XR market and identifying customer gaps and needs. In this step, the needs, and preferences of (end) users and customers are prioritized to shape the strategy. The objective is to establish a solid foundation for defining an effective exploitation strategy by examining the current market and identifying potential opportunities for leveraging the results of the PRESENCE project. Section.2 Market Analysis provides the framework for PRESENCE's growth scenario and ensures awareness of current and future developments that may impact the project.

3.2.2. Component 2: creation of exploitation strategies

The exploitation strategies provide a comprehensive project overview, highlighting key elements relating to exploitation, such as methods for identifying and engaging stakeholders and facilitating, for example, technology transfer. Specific individual exploitation plans will be devised to ascertain the expectations and intentions of each consortium member regarding the utilization of project outcomes in their respective businesses or further research endeavour, see Section 3.4.1 Individual exploitation plans. This process employs a co-design approach, incorporating consortium members into the strategy development phase to ensure their perspectives and expectations are duly considered.

3.2.3. Component 3: Joint Business Clinics

To develop an integrated strategy for exploiting the results of PRESENCE, three Joint Business Clinics (JBC) will be organized. These workshops are designed to present and demonstrate the key features of PRESENCE to business experts from different markets, discuss their needs and gaps, and assess how PRESENCE could deliver value to specific customer segments. Additionally, the workshops will facilitate discussions with potential early adopters and explore partnerships with external companies to support technological advancements for future market introduction. The JBCs take a co-creation approach, engaging industry experts in the strategy development process to ensure their perspectives and needs are thoroughly considered.



3.2.4. Component 4: PRESENCE value proposition & commercial strategy

Based on the input gathered during the Joint Business Clinics (JBCs) and comprehensive market analysis, a Minimum Viable Product (MVP) and a high-level business model will be defined. This process will be user-centred, utilizing the insights from the workshops and market analysis to inform the development of the MVP and business model. The workshops will provide the following: (1) assess how PRESENCE's solution can be applied in specific markets, (2) identify the key features customers seek in specific use cases, and (3) develop unique value propositions for different customer segments. Business models for multiple selected use cases will be formulated, ensuring that Human-Centred Design (HCD) methodology and concepts are seamlessly integrated into the commercial strategy.

3.2.5. Component 5: component & IP management

Before exploiting the results of an EU-funded collaborative project, it is crucial to clearly understand each participant's potential contributions, common goals and expected outcomes, and reaching a joint agreement on the terms of use and access to the intellectual property (IP) generated during the project. This step helps prevent conflicts and supports both individual and joint exploitation of the results. As such the consortium will track the attributes, components, and contributions from each participant that together make up PRESENCE.

3.2.6. Component 6: results consolidation with human-centred approach

This section synthesizes key project results and lessons learned from previous sections during M30 onward, to offer a comprehensive overview of the available exploitation options for the PRESENCE project. Adhering to the Human-Centred Design (HCD) approach, we will prioritize the needs and perspectives of customers and users, ensuring that the PRESENCE solution is both designed and marketed to meet their needs and deliver value. The consolidation of results includes a thorough evaluation of the potential impact of the PRESENCE project on various user groups and considers the ethical and societal implications to ensure the solution is socially responsible and sustainable. This step provides a human-centred and user-oriented roadmap for the future development and commercialization of the PRESENCE solution.

3.3. Market and customer analysis (component 1)

3.3.1. Market analysis

For our market analysis see Section 2 Market Analysis.

3.3.2. Customer analysis

For developing and validating fitting exploitation options, engaging with potential customers, users, producers, and consumers is pivotal. The PRESENCE approach is deeply rooted in the principles of Human-Centred Design (HCD), aiming to ensure that the solutions offered truly resonate with the intended audience. Through multifaceted interaction with diverse stakeholder groups—facilitated via Joint Business Clinics, focus groups, and user interviews—we strive to gain deeper insights that deliver better outcomes.

PRESENCE aims to foster robust engagement with potential users, thereby facilitating a better understanding of their needs and preferences. Recognizing the importance of diversity in these engagements, PRESENCE emphasizes the inclusion of a broad spectrum of participants, ranging from small startups to established corporations, commercial entities, and esteemed universities.

This diversity not only enriches the validation process by preventing groupthink but also encourages a wider range of perspectives and insights. By actively involving this varied group of stakeholders,



PRESENCE aims to gather valuable information regarding the market landscape, prevalent pain points, and emerging trends. Such insights help refining and tailoring our value propositions to effectively address the identified challenges and provide compelling solutions.

3.3.2.1. Personas and target segments

In PRESENCE our starting point is that user types and target segments follow the lines of the four PRESENCE Use-Cases, with each target segment consisting of multiple user types: developers (producer-side) and end-users (consumer-side). These personas were created during 4 collaborative cross-Work Package workshops led by WP1. Our initial assumption in WP6 is that there might be an additional user type per target segment that focuses more on the business-side and works together, or overlaps with, the developer persona - shortly described below as well. We set out to research and validate this assumption leading up to, and during, JBC#1, as the roles and responsibilities of those participating in this event will give us additional insight into this assumption.

The current target segments and user types that have been identified by PRESENCE are as follows, for a complete overview see Annex II: PRESENCE personas:

⇒ Use Case 1.1 - **Professional Collaboration**: Virtually convene, discuss, and evaluate design concepts with remote colleagues using XR technology for immersive professional collaboration.

- **Producer Harry (XR Developer)** an XR developer with a software engineering background, is dedicated to revolutionizing professional collaboration through immersive XR experiences. His goals include developing meeting environments that simulate real-world interactions by integrating APIs for virtual humans, holoportation, and haptics, and enabling remote participation through advanced XR technology. He faces challenges in ensuring seamless API integration, balancing realism and usability, and managing user expectations in evolving collaboration settings. Harry is driven by the potential to contribute to advancements in XR technology for business applications, creating intuitive and transformative collaboration experiences.
 - Harry is eager to develop on the basis of PRESENCE because it offers cutting-edge technology that allows him to push the boundaries of immersive meeting environments. By leveraging PRESENCE, he can innovate and refine XR applications, making virtual collaboration as seamless and realistic as possible.
- **Consumer Hanna (Project Manager, Meeting Lead)** is driven by the goal of enhancing team collaboration and communication through innovative XR tools. She seeks to improve workflow efficiency and foster a culture of innovation within her team by implementing real-time project management solutions. Her primary challenges include integrating XR tools with existing software systems, addressing security concerns in virtual environments, and managing the learning curve for team members new to XR technology. Hanna is eager to explore how XR technology can elevate her team's productivity and innovation, despite these technical barriers.
 - Hanna would like to use PRESENCE to seamlessly integrate XR tools into her project management processes, enhancing team collaboration and efficiency through immersive experiences. By adopting PRESENCE, she aims to foster innovation within her team and gain a competitive edge through cutting-edge technology.
- **Consumer Daniel (Consultant, Meeting Participant)**, an organizational development and change management consultant, aims to leverage XR technology to enhance client engagement and foster creativity within teams. He strives to improve client presentations, collaborate effectively with remote team members, and reduce travel costs and time associated with on-site meetings. His main challenges include overcoming resistance from clients and team members unfamiliar with XR technology and managing client expectations



regarding virtual representations. Daniel is excited about how PRESENCE can break down collaboration barriers and drive innovation across organizations.

- Daniel would like to use PRESENCE to introduce cutting-edge technology that can elevate team collaboration and drive creative solutions. He is eager to leverage immersive experiences to break down traditional barriers and engage clients more effectively.

⇒ Use Case 1.2 - **Manufacturing Training**: Step into the future of training as you immerse yourself in a virtual world, mastering machine operation under expert guidance.

- **Producer Max (XR Software Engineer)** an XR software engineer with expertise in computer science and AI, is passionate about leveraging XR technologies to revolutionize manufacturing training. His primary goals include developing multisensory XR training applications that integrate virtual humans, haptics, and holoportation to create immersive learning experiences. Max faces technical challenges in achieving seamless integration of these advanced features while ensuring the effectiveness of the training applications. He believes that XR has the potential to make professional training safer, more engaging, and significantly more effective for new hires in the manufacturing sector.
 - Max is eager to develop on the basis of PRESENCE because it offers the tools and technology needed to push the boundaries of immersive training applications for manufacturing. By leveraging PRESENCE, he can integrate advanced features like virtual humans, haptics, and holoportation seamlessly, making training experiences safer, more engaging, and highly effective.
- **Consumer Karen (Manufacturing Trainer)** is committed to revolutionizing employee onboarding and training processes through XR technology. Her goals include implementing XR training simulations to enhance safety awareness, streamline onboarding, and identify training gaps among the existing workforce. Karen faces challenges in aligning XR training content with learning objectives, addressing resistance from employees accustomed to traditional methods, and overcoming logistical hurdles in deploying XR hardware and software. She believes that XR has the potential to lay the foundation for a highly skilled and safety-conscious workforce in the manufacturing industry.
 - Karen is eager to use PRESENCE because it offers the opportunity to revolutionize employee training through immersive XR simulations, enhancing safety awareness and streamlining the onboarding process. By leveraging PRESENCE, she aims to bridge training gaps, improve learning outcomes, and cultivate a highly skilled workforce in the manufacturing industry.
- **Consumer Alex (Production Technician)** a recent mechanical engineering graduate, is eager to advance his career in manufacturing by gaining hands-on training and practical experience. His goals include becoming proficient in operating machinery, improving troubleshooting skills, and ensuring compliance with safety protocols. Alex faces challenges in adapting to new XR interfaces and ensuring alignment between virtual simulations and actual workplace conditions. He believes that XR training offers a valuable opportunity to accelerate his learning curve and excel in his role as a production technician.
 - Alex is keen to use PRESENCE because it provides a valuable opportunity to accelerate his learning curve in manufacturing through immersive XR simulations. By leveraging PRESENCE, he aims to gain hands-on experience, improve skills, and ensure compliance with safety protocols, ultimately advancing his career prospects in the industry.



⇒ Use Case 2.1 - **XR Pain & Stress relief**: Alleviate patient anxiety during medical procedures through immersive XR experiences. Receive personalized support and distraction, enhancing comfort and reducing stress.

- **Producer Maya (XR Developer)**, specializing in healthcare applications, is dedicated to leveraging emerging technologies to create immersive experiences for pain and stress reduction. Her goals include creating multisensory immersive experiences and integrating haptics, holoportation, and virtual human APIs into XR applications for health. Maya faces challenges in overcoming technical hurdles and ensuring the usability and user acceptance of developed XR applications, but she believes in the endless possibilities that these technologies offer for enhancing user engagement and experience in therapy plans.
 - Maya is excited to develop based on PRESENCE because it provides the tools and technology needed to integrate advanced features like haptics, holoportation, and virtual human APIs seamlessly into XR health applications. By leveraging PRESENCE, she aims to create immersive and acceptable experiences that enhance user engagement and improve therapy outcomes for patients.
- **Consumer Lucas (Clinical Psychologist, Therapist)** specialises in stress and pain management, and is enthusiastic about integrating XR technology into therapy sessions to offer more immersive experiences for his clients. His goals include reducing stress and pain levels by customising immersive experiences tailored to each patient's needs and preferences, while staying updated on the latest advancements in XR technology and therapeutic applications. Lucas faces challenges in overcoming potential resistance from patients unfamiliar with XR-based interventions, addressing technical limitations of XR hardware and software, and balancing the integration of XR technology with established therapeutic techniques. He believes that harnessing the potential of XR technology opens new avenues for enhancing traditional therapeutic approaches and improving patient engagement and adherence to therapy protocols.
 - Lucas is eager to use PRESENCE because it offers the tools and technology needed to create immersive XR experiences tailored to each patient's therapeutic needs, thereby enhancing stress and pain management interventions. By leveraging PRESENCE, he aims to improve patient engagement and adherence to therapy protocols, ultimately providing more effective and personalised care in his clinical practice.
- **Consumer Sarah (Patient & Therapy Receiver)** struggling with chronic stress and pain, is motivated to explore alternative therapies and innovative approaches to improve her overall well-being. Her goals include reducing stress and pain levels through immersive XR therapy sessions, learning coping mechanisms tailored to her needs, and enhancing emotional regulation and resilience to stress triggers. Sarah faces challenges such as potential discomfort with XR hardware and software and managing expectations regarding the timeline and outcomes of therapy sessions. However, she remains open to exploring XR therapy as a promising avenue to address her challenges and prioritise her mental and physical health.
 - Sarah is interested in using PRESENCE outcomes because it offers a promising avenue to alleviate her chronic stress and pain through immersive XR therapy sessions, tailored to her specific needs and preferences. By leveraging PRESENCE, she hopes to explore new coping mechanisms and relaxation techniques, ultimately improving her overall well-being and quality of life.

⇒ Use Case 2.2 - **XR for Cultural Heritage**: With XR technology, explore historical events firsthand alongside virtual guides and witnesses. Experience the tension, make pivotal decisions, and rewrite the past through immersive storytelling.



- **Producer Anna (XR Software Developer)** has expertise in computer graphics and 3D art, is driven by her passion to make cultural heritage more accessible through XR technologies. Her goals include developing immersive experiences of cultural sites and integrating advanced features like holoportation, haptics, and virtual humans APIs to enhance virtual visits. Anna faces challenges in adapting and tailoring these technologies for specific touristic experiences and balancing interactivity with the authenticity of cultural artifacts. She believes that XR has the potential to redefine tourism by offering immersive and engaging experiences that preserve and showcase our rich cultural heritage.
 - Anna is eager to develop based on PRESENCE because it offers the technology needed to create immersive XR experiences of cultural heritage sites, making them more accessible and engaging for a wider audience. By leveraging PRESENCE, she aims to preserve and showcase cultural heritage through digitalization, redefining tourism and enriching the cultural experience for visitors.
- **Consumer David (Museum Curator, Tour Guide)** sees XR technology as a valuable tool for preserving cultural heritage and engaging audiences with richer narratives. His goals include developing immersive XR tours and exhibits that highlight the significance of cultural artifacts, fostering a deeper appreciation and understanding of history, and reaching wider audiences to make cultural experiences accessible to all. David faces challenges in balancing technological innovation with preserving the authenticity of artifacts and ensuring inclusivity and accessibility in XR experiences for diverse audiences. He believes that XR technology has the potential to bring history to life in ways that were previously unimaginable, connecting people to their past and inspiring future generations.
 - David is enthusiastic about using PRESENCE because it offers the opportunity to develop immersive XR tours and exhibits that bring cultural heritage to life in unprecedented ways, enriching the museum experience for visitors. By leveraging PRESENCE, he aims to engage audiences with richer narratives, preserve authenticity, and make cultural experiences more accessible to a wider audience, ultimately fulfilling his mission of educating and inspiring others about the importance of cultural heritage.
- **Consumer Sophia (Tourist)** an avid traveller and history enthusiast, sees XR technology as a means to enhance her exploration of cultural heritage sites and make historical experiences more immersive and accessible. Her goals include engaging in XR tours to learn about the history, art, and architecture of the places she visits, as well as capturing and sharing memorable experiences with friends and family. Sophia faces challenges such as concerns about the authenticity and accuracy of XR representations, technical barriers with XR devices and platforms, and balancing XR experiences with traditional travel experiences. However, she believes that XR technology has the potential to enrich her travel experiences and allow her to step into the pages of history in unprecedented ways.
 - Sophia is excited about using PRESENCE because it offers the opportunity to engage in immersive XR tours of cultural heritage sites, enriching her travel experiences and allowing her to delve deeper into the history, art, and architecture of each destination. By leveraging PRESENCE, she hopes to capture and share memorable experiences with friends and family, while also embracing innovative technologies that enhance her exploration of different cultures and historical sites.

Our initial assumptions and hypothesis are that, beside the above user personas, there are 4 B2B personas that focus more on what PRESENCE can offer from a business perspective and that we should actively invite to, and engage with, during Joint Business Clinics. These 4 personas are still in development and have yet to be further researched and validated with other Work Packages, and during the first Joint Business Clinic. Here is a short overview:

- **Professional Collaboration: Ethan (Developer Lead)** leads a team of XR software developers tasked with creating immersive collaboration tools for businesses. He is focused



on leveraging PRESENCE to develop customizable XR solutions that streamline remote work processes and enhance team productivity. Ethan's goal is to deliver XR applications tailored to clients' specific needs, offering innovative solutions that drive efficiency and collaboration in professional environments.

- Manufacturing Training: **Olivia (XR solutions consultant)** specializing in manufacturing training applications. She works closely with clients to assess their training needs and develop tailored XR solutions using PRESENCE. Olivia focuses on demonstrating the business value of XR technology in improving training outcomes, reducing costs, and increasing operational efficiency for manufacturing companies. Her goal is to help clients adopt XR training solutions that optimize workforce performance and drive business growth.
- XR Health: **Ryan (Healthcare Technology Executive)** responsible for implementing innovative solutions in patient care. He sees the potential of PRESENCE in transforming healthcare delivery by integrating XR technology into clinical settings on pain relief. Ryan's focus is on evaluating the ROI of XR health applications, ensuring regulatory compliance, and driving adoption across healthcare organizations. His goal is to leverage PRESENCE to improve patient outcomes, enhance patient experiences, and differentiate his organization in the competitive healthcare market.
- XR for Cultural Heritage: **Ada (Museum Technology Director)** leads digital initiatives to enhance visitor experiences. She recognizes the value of PRESENCE in digitizing cultural heritage and engaging audiences with immersive XR experiences. Maya's focus is on aligning XR initiatives with the museum's strategic goals, securing funding for XR projects, and measuring their impact on visitor engagement and revenue generation. Her goal is to position the museum as a leader in leveraging XR technology to preserve and promote cultural heritage while driving attendance and revenue growth.

The next steps are focussed on substantiating the above insights and gaining an initial impression of the pains, gains, and jobs-to-be-done by these personas. This step will be taken during the first upcoming Consortium meeting where we will concrete with the consortium partners on multiple Value Proposition Canvases (VPCs) (see Section 3.6.1). By combining the above insights and VPCs we can (in)validate our assumptions during the JBC#1. In D6.2 an update on the current status of the customer analysis will be given.

3.3.2.2. Interactions with customers and users

In PRESENCE a mixed method will be used to collect user requirements. Qualitative methods such as co-creation sessions and interviews will be used to gain insights into users' current practices, values, attitudes and behaviours. This provides high internal validity, but on the other hand has low external validity (generalizability). Quantitative methods such as surveys make it possible to collect larger data sets which then makes external validity higher. The aim is to identify the requirements and limitations the current technology². This will be done through an iterative process of, on the one hand, gathering feedback from stakeholders and, on the other, integrating the feedback into the technology. See Figure 4: WP1 PRESENCE iterative process and milestones for a short visual overview of the iterative process within Presence for our methodology on interaction with customers and users from a WP1 - Human Centred Development perspective.

² D1.1 Human Centered Development Phase I Foundations, Requirements and Initial Planning' gives a more detailed understanding of our qualitative methodology on interaction with customers and users. This is a *Sensitive* document with access limited to the project consortium members.

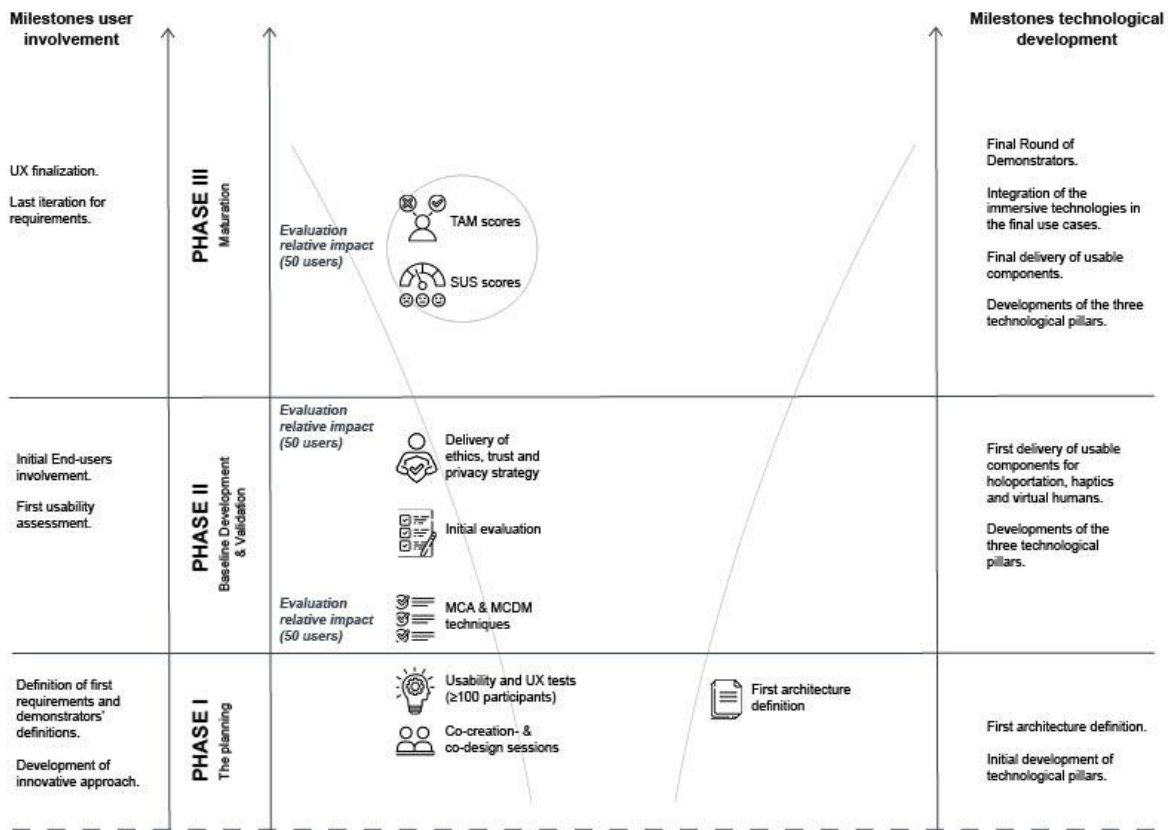


Figure 4: WP1 PRESENCE iterative process and milestones

3.3.2.3. Joint Business Clinics

As outlined in Section 3.1 Methodology, PRESENCE WP6 will focus on a 3-cycle model for user validation and exploitation. Essential part of our methodology are the Joint Business Clinics (JBCs), of which we conduct a minimum of 3. Inviting in potential customers, experts, professionals, etc to cocreate with us the outcomes and direction of PRESENCE. As one of six essential components of our exploitation approach I refer you to 3.5 Joint Business Clinic (component 3) for a more in depth understanding of these JBCs.

3.3.2.4. Focus groups

A focus group is a small group interview of 4-6 people with similar backgrounds. The aim is to get qualitative insights into a market or societal sphere for which you want to develop a product or service.

The idea for the PRESENCE focus groups is to find out the requirements of the project's target groups. To gather such information, content creators from all relevant areas were invited to participate in guided group interviews.

3.3.2.5. User Interviews

A user interview is a type of qualitative research that is used to gather insights and feedback from real users about our product, service, and experience. In PRESENCE WP6 we will use user interviews as another method to validate our value proposition in conjunction with JBCs, focus groups, and internal interviews.

The aim is to analyse and identify common themes, patterns, and insights. As to consider how these insights may impact PRESENCE and to iterate and improve defining the best exploitation options

based on customer and user insights. Thus, keeping an eye on the best product-market fit possible and designing for this in a human driven way.

The first round of user interviews will be planned in the months after JBC#1 and serve as validation of Joint Business Clinic insights. We will use snowball sampling and ask consortium partners to refer us to promising potential users already in their network.

3.4. Creation of exploitation strategies (component 2)

As PRESENCE, we are steadily advancing towards the development of joint exploitation strategies, which are becoming increasingly defined over the course of the next 30 months. By integrating results and insights from all six exploitation components, we aim to develop validated exploitation strategies in activities such as the third Joint Business Clinic. These strategies will be crafted to address the needs of our users, delineate how we can deliver benefits to customers and markets, and outline joint commercialization and monetization plans for PRESENCE. This comprehensive approach will be the focus of the third cycle of PRESENCE's user validation and exploitation activities. Our first step towards outlining and validating these plans is to gather, analyse, and bundle exploitation plans on consortium partner level. These individual exploitation plans will be reported on in D6.2.

3.4.1. Individual exploitation plans

The PRESENCE project highlights the significance of each partner utilizing their findings to create the greatest possible impact. To achieve this, we have devised a strategy for defining Minimum Viable Products (MVPs) and distributing validation questionnaires to consortium partners. These plans, building on the current deliverable's information and future insights, will prioritize the needs and viewpoints of customers and users in the relevant markets. By integrating Human-Centered Design (HCD), we aim to ensure that our PRESENCE solutions are not only technically robust but also align with the needs and expectations of their users.

The initial version of the individual exploitation plan, which includes Business Model Canvases (BMC) at the partner level and internal validation questionnaires, will be incorporated and updated starting from Deliverable D6.2. At this preliminary stage, we will concentrate on the methodology and provide an overview of the Individual Exploitation Plan questions, tables, and BMC

The BMC was created by Alexander Osterwalder, of Strategyzer. PRESENCE will be using the Creative Commons version supplied by Design a Better Business and the concurrent step-by-step guide they provide.³

The individual exploitation plan will include the following sections, for the full survey see Annex III: Individual exploitation plans:

- **Exploitation:** This involves outlining an individual commercial exploitation plan to support the Business Model Canvas (BMC). The plan encompasses market focus, business planning, and commercialization strategy questions. Additionally, it includes a table to detail non-commercial project outcomes.

Validation: By integrating feedback and insights obtained from validation questionnaires and other methods, we can refine and enhance our value propositions. This process aims to develop an ecosystem that truly resonates with and meets the needs of our target audience. The questionnaire covers topics such as products and services, markets and customers, commercial and community value, and intellectual property rights (IPR) protection.

³ Design a Better Business (n.d.) Business Model Canvas. Retrieved from: <https://www.designabetterbusiness.tools/tools/business-model-canvas> (last visited on February 22, 2023)

3.5. Joint Business Clinic (component 3)

Embedded within PRESENCE's strategic framework, the Joint Business Clinics (JBCs) emerge as pivotal components, driving our integrated exploitation strategy forward. These JBCs, central to our methodology, characterize a tripartite cycle of user-validation activities, intended to pinpoint PRESENCE's optimal market positioning for sustained innovation and exploitation. Leveraging a human-centred design approach, these clinics aim to delve deeply into the needs and challenges confronting potential customers, while simultaneously exploring avenues through which PRESENCE can deliver compelling value to distinct customer segments.

Objectives of the PRESENCE Joint Business Clinics	
01	Demonstrating expected key results identified for exploitation
02	Validating the market and problem by identifying and verifying market and end-user needs
03	Exploring potential business models for the exploitation of PRESENCE
04	Investigating external partnerships with the potential to accelerate the exploitation of PRESENCE results for future market uptake

Table 4: Objectives of the PRESENCE JBCs

These three consecutive JBCs form a pivotal part of the process in defining PRESENCE's integrated exploitation strategy, offering an unparalleled opportunity for PRESENCE to gain hands-on experience, gather fresh perspectives, and validate its value proposition with potential customers.

The JBCs assemble business experts from diverse markets, encompassing those interested in utilizing XR solutions or providing related services to customers. These workshops afford PRESENCE the chance to showcase its key assets and demonstrate its capacity to address market needs and gaps. Furthermore, the JBCs serve as a platform for engaging with business experts, enabling PRESENCE to deeply understand customer needs and assess its potential to meet those needs and resolve existing issues.

Another critical objective of the exploitation workshops is to explore potential partnerships with external entities interested in investing further in technological developments for future market adoption. These workshops present opportunities to identify such entities and explore potential collaborations to expedite the commercialization of the PRESENCE solution.

By adopting a human-centred approach, the JBCs ensure that the PRESENCE solution is finely tuned to meet the genuine needs and requirements of the market. These three consecutive JBCs are integral to the process of defining PRESENCE's integrated exploitation strategy, offering an unparalleled chance for PRESENCE to garner practical experience, gather fresh insights and innovative concepts, and validate its value proposition with potential customers.

A co-creative approach will be taken for the organization of the three workshops:

3.5.1. The First Joint Business Clinic (JBC#1)

In JBC#1 we anticipate engaging a diverse group of participants, including internal stakeholders. This session will serve as a platform to delve into customer problems and needs across various sectors, aiming to collaboratively craft a comprehensive PRESENCE business model and delineate customized value propositions tailored to specific customer segments. With a focus on brainstorming potential solutions to address imminent challenges within the next three years, we will consider factors such as risks, success metrics, tests, costs, and timelines crucial for the effective deployment of the PRESENCE solution(s).

As we gather insights from this session, we aim to validate market interest in key sectors, ensuring alignment between PRESENCE's offerings and market needs. Furthermore, breakout sessions will facilitate the creation of market-specific Lean Canvasses and Value Proposition Canvasses, enabling us to formulate and validate hypotheses about personas and user types. These insights



will be refined and validated further during subsequent consortium meetings, paving the way for the successful execution of our integrated exploitation strategy.

3.5.2. The Second Joint Business Clinic (JBC#2)

JBC#2 will serve as a continuation of the insights garnered from JBC#1 and relevant exploitation activities, focusing on the most pertinent markets for the PRESENCE solution. Our objective is to delve deep into the specific challenges faced by participants in these identified markets, unravelling the barriers, pains, and needs they encounter. Through interactive sessions, we aim to explore how PRESENCE can offer tangible value to address these challenges effectively and achieve product-market fit. Participants will play an integral role in developing use cases for the application of PRESENCE, while also assessing any additional functionalities required to ensure the sustainability of these use cases.

We plan to initiate discussions with participants, showcasing PRESENCE and seeking their input on its potential applications. A user survey will be conducted to gain deeper insights into participants' current responsibilities and the primary challenges they face in their roles, with a focus on how PRESENCE could serve as a solution. Subsequently we will prioritize validating user types and refining the value proposition for each user category. These sessions will provide an opportunity for in-depth discussions, enabling us to collaboratively research, co-create, and validate user types, value propositions, and services with our participants. The insights gathered during JBC#2 will be instrumental in refining our offerings and solidifying our market presence as we progress in our journey towards achieving product-market fit.

3.5.3. The third Joint Business Clinic (JBC#3)

Scheduled for the 3rd cycle spanning months 20-30 of the project, JBC#3 is geared towards delivering a compelling business pitch for the PRESENCE solution, spotlighting the value it is poised to deliver to target markets. This workshop is strategically designed to validate the willingness of customers to pay, assess our Minimum Viable Product (MVP), pinpoint high-priority use cases, and deliberate on additional functionalities necessary to fulfil market demands and drive sales of the PRESENCE solution.

The culmination of this event will yield a comprehensive understanding of customer needs, prevailing market challenges, and the transformative potential of PRESENCE in crafting a winning proposition. These insights will serve as the bedrock for formulating hypotheses concerning PRESENCE's Business Models and (Joint) Exploitation Plans. These hypotheses will subsequently undergo rigorous development and validation during the project's final months, ensuring that PRESENCE leaves a lasting impact on its target markets.

3.6. PRESENCE value proposition & commercial strategy (component 4)

Overall, the PRESENCE process for designing a value proposition involves a thorough understanding of the target customer, defining customer segments, analysing competitors, and crafting a value proposition that genuinely benefits the customer. By adhering to the human-centred process, PRESENCE can develop a value proposition that caters to the needs of our users and customers, helping us differentiate ourselves from the competition.

The six components together will gather extensive information and data, which will be crucial in shaping the PRESENCE exploitation strategy and value proposition. We will transform this information and data into valuable, validated value propositions through the following steps:

- **Defining the Target Audiences:** The initial step in creating a value proposition is understanding our target audience. This involves researching and identifying their needs, pain points, and desires. By comprehending our target audiences, we can craft a value proposition that specifically addresses their needs and resonates with them.



- **Identifying Unique Selling Points:** Next, we analyse our product or service to identify what distinguishes it from the competition. What are the unique features, benefits, and values that PRESENCE offers that others do not?
- **Understanding Customer Benefits:** After identifying our unique selling points, we need to determine how these will benefit the target audiences. What outcomes will the PRESENCE target audience experience by using our product or service?
- **Creating a Clear and Concise Message:** The next step is to craft a value proposition statement that clearly communicates the unique selling points and benefits to the PRESENCE target audience. This statement should be concise, easy to understand, and memorable.
- **Testing and Refining:** The final step is to test and refine the PRESENCE value proposition. This involves gathering feedback from target audiences, analysing customer behaviour, and continuously refining the proposition to ensure it effectively resonates with the target audience.

In the following sections, we will focus on the tools PRESENCE uses to create a validated and aligned value proposition and a high-level business model based on the BMC. This will provide an initial insight into what the PRESENCE Minimum Viable Product (MVP) might be.

By following the discussed methodology, we are able to integrate two approaches (HCD and Lean Start-Up), thus allowing the PRESENCE project to develop the exploitation strategies and value propositions are not only aligned with the target market but also grounded in evidence and validated through continuous testing and iteration.

3.6.1. Value Proposition Canvas

To thoroughly understand our customers—including their jobs-to-be-done, pain points, and desired gains—along with our unique value offer, PRESENCE will utilize the Value Proposition Canvas (VPC) and the step-by-step guide from Design a Better Business⁴. By creating, validating, and iterating the canvas, we will develop the initial version to be included in Deliverable D6.2. This process will enable PRESENCE to produce outcomes that are specifically tailored to the needs of our target clusters, users, and customers.

These initial VPCs will undergo (in)validation and iteration during the planned Joint Business Canvases (JBCs), market analysis, and user interviews. Over the course of upcoming deliverables, they will be reviewed and updated as necessary.

3.6.2. Business Model Canvas

The Business Model Canvas (BMC) is a digital tool that outlines both existing and new business models, giving a comprehensive overview of PRESENCE. It details how we plan to monetize our products and services by visually presenting our value proposition, customer segments, channels, customer relationships, revenue streams, and cost structure.

This strategic tool is designed to map and visualize the critical components of our business model. The BMC's main goal is to illustrate our exploitation strategy visually and serve as a foundational guide for developing PRESENCE.

3.6.2.1. Preliminary Business Model Canvas

The initial BMC is derived from the Market and Value Chain analysis presented in Section 2. In this section, it was concluded that the three technological pillars of PRESENCE differ in their added value

⁴ Design a Better Business (n.d.) Value Proposition Canvas. Retrieved from: <https://www.designabetterbusiness.tools/tools/value-proposition-canvas> (last visited on February 22, 2023)



to the XR value chain. Based on these findings, three preliminary BMC's have been developed for each of the three technological pillars - Holoportation, Haptics and Virtual Humans - to provide a tailored approach for each technology. By focusing on the specific benefits and competitive advantages each pillar offers, we can better align our strategies with market needs and customer expectations and highlight the Unique Value Proposition of each of the three technological pillars of PRESENCE. The preliminary versions offer a clear and visual overview of our potential business models, helping stakeholders during JBC#1 and consortium meetings to better understand, communicate, and refine their ideas. The goal is to (in)validate and build upon the initial BMC, with multiple iterations expected throughout the project.

These BMCs will serve as living documents, continually refined through stakeholder feedback, individual exploitation plans (see Section 3.4.1 Individual exploitation plans), and consortium meetings involving the relevant partners for each use case. This iterative process will enable us to adapt and improve our business models, ensuring they remain robust and responsive to market dynamics.

By breaking down the BMC components, PRESENCE will achieve a detailed view of the project, pinpointing potential challenges, opportunities, and solutions. The BMC will serve as a tool to test and validate various exploitation strategies, allowing us to iterate on our business model until we find successful solutions. This structured approach ensures all stakeholders can contribute effectively, enhancing the overall development and validation process.

The preliminary Business Model for PRESENCE consists of the following elements and information, see Annex V: Business Model Canvas for an overview of our 3 preliminary BMCs.

3.6.2.1.1. *Key partners*

The success of PRESENCE heavily relies on strategic partnerships that support its three technological product pillars: Holoportation, Haptics, and Virtual Humans.

- **Holoportation SDK:** Key partners include companies specializing in XR hardware to capture high-fidelity volumetric data, VR hardware manufacturers to ensure SDK compatibility, XR software development companies for integrating the SDKs, and telecom providers for fast data transmission.
- **Haptics SDK:** Essential partners for the Haptics SDK are sensor and actuator manufacturers for creating physical feedback components, XR software development companies for SDK integration, and VR hardware manufacturers for ensuring compatibility.
- **Virtual Humans SDK:** For the Virtual Humans SDK, key partners are animation and motion capture studios for creating realistic animations, cloud service providers for data processing and storage, and XR software development companies for SDK integration.

3.6.2.1.2. *Key activities*

The core activities for each SDK focus on developing and maintaining cutting-edge technology while ensuring excellent customer support.

Holoportation SDK: Key activities include R&D for developing volumetric capture technology, deployment and maintenance of robust infrastructure, and potentially providing customer support and training to assist users in implementation and usage.

Haptics SDK: For the Haptics SDK, key activities involve understanding customer needs to tailor feedback algorithms, creating and refining haptic feedback algorithms integrated with hardware, and, for example, offering customer support and training.

Virtual Humans SDK: The Virtual Humans SDK requires AI training development to create responsive virtual agents, with a focus on ethical AI use.

3.6.2.1.3. *Key resources*

The development of each SDK relies on specific technological assets and expert personnel.



- **Holoportation SDK:** Key resources include advanced volumetric video capture technology, specialists in software engineering for development and maintenance, and a professional network and relationships for strategic collaborations.
- **Haptics SDK:** Critical resources for the Haptics SDK are tools for integrating haptics, specialists in software engineering focusing on data compression and network communication, and a professional network and relationships.
- **Virtual Humans SDK:** The Virtual Humans SDK's key resources encompass machine learning models and algorithms for creating virtual agents, computational infrastructure for data processing, and an expert team in AI and ML for advanced development.

3.6.2.1.4. Value Proposition

Each SDK offers unique value propositions that address specific market needs and enhance user experiences.

- **Holoportation SDK:** Provides real-time 3D volumetric streaming that enhances remote presence far beyond traditional video conferencing or VR experiences. It offers seamless, low-latency transmission of high-resolution data over existing network infrastructures.
- **Haptics SDK:** Enhances virtual and augmented reality experiences with realistic tactile feedback, making digital interactions feel physical and intuitive. It provides a comprehensive toolkit for integrating sophisticated haptic feedback into any XR application.
- **Virtual Humans SDK:** Delivers AI-powered virtual agents that mimic human behaviour and emotions through ML-powered animations, enhancing user interaction and emotional engagement.

3.6.2.1.5. Customer segments

PRESENCE targets a wide range of customer segments for its SDKs.

- **Holoportation SDK:** VR/AR content developers and end users such as telemedicine, gaming, tourism, engineering, architectural teams, and education sectors.
- **Haptics SDK:** Similar to Holoportation, targeting VR/AR content developers and end users in telemedicine, gaming, tourism, engineering, architectural teams, and education sectors.
- **Virtual Humans SDK:** Targets VR/AR content developers and end users including customer-facing businesses, retail, gaming, education, banking, and hospitality sectors.

3.6.2.1.6. Channels

To reach its target customers, PRESENCE employs a combination of direct and indirect communication methods.

All SDKs: Channels include an online presence and marketing, referral and word-of-mouth, direct sales, and interactive demos at industry events.

3.6.2.1.7. Customer relationships

Building and maintaining strong customer relationships is crucial for PRESENCE.

All SDKs: Customer relationships are fostered through Joint Business Clinics (JBCs), conferences, tech support, and training and consultation services.

3.6.2.1.8. Revenue streams

PRESENCE generates revenue through various streams tailored to each SDK.

All SDKs: Revenue streams include integration services for custom solutions, subscription fees for ongoing access, maintenance and support contracts for regular updates and assistance, and upgrade and customization services for tailored enhancements.

3.6.2.1.9. Cost structure

Understanding and managing costs is essential for the sustainability of each SDK.



- **Holoportation SDK:** Major costs include research and development, infrastructure deployment and maintenance, personnel, and marketing and sales.
- **Haptics SDK:** Similar to Holoportation, with costs associated with research and development, infrastructure deployment and maintenance, personnel, and marketing and sales.
- **Virtual Humans SDK:** Costs include AI and machine learning development, cloud infrastructure, research and development, personnel, and marketing and sales.

3.6.3. PRESENCE key features

In this section we will outline the key features PRESENCE has to offer and that will inform our exploitation options and value propositions.

3.6.3.1. Holoportation

Holoportation is an advanced technology that leverages volumetric cameras and sophisticated data processing to capture, reconstruct, compress and transmit 3D representations of people in real-time. This capability enables users to see and interact with photorealistic and full-scale holograms of remote participants within virtual reality (VR), extended (XR) or augmented (AR) environments, significantly enhancing the feeling of presence and immersion. Holoportation stands out as a key enabler for VR/XR/AR experiences because it transcends traditional video conferencing limitations by providing a feeling presence. Users can move around and interact with the holograms as if they were physically co-present, facilitating more natural and engaging interactions between them-selves and other users. This technology is particularly

valuable in scenarios such as remote collaboration, virtual meetings, training, and social VR applications, where the quality of human interaction is critical.

The core functionality of multi-user holoportation involves 3 steps:

- **Capture:** Volumetric cameras placed around the subject capture high-resolution images from various angles.
- **Reconstruction:** Captured data is reconstructed, creating a lifelike hologram.
- **Transmission:** The 3D data is compressed and transmitted over the network with minimal latency, ensuring a real-time interaction.

To wrap-up all this technology and facilitate the implementation of it to VR/XR developers, we have generated an Holoportation SDK, enabling the feeling of presence to their use cases.

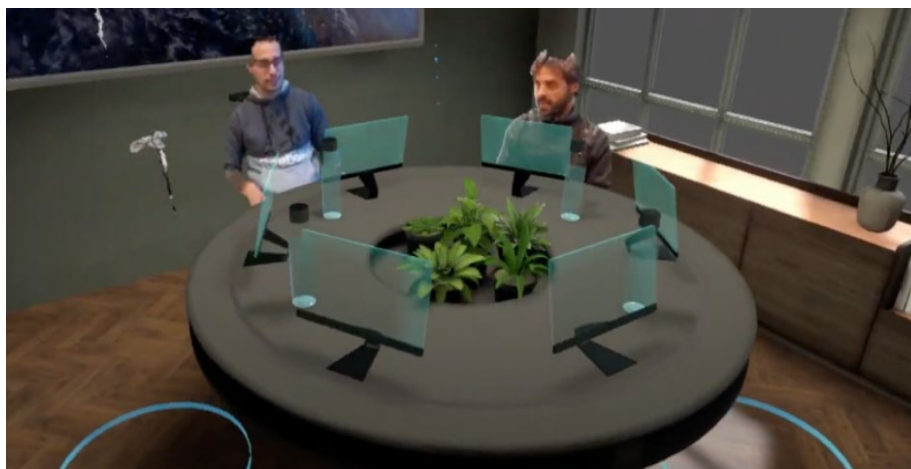


Figure 5: Holoportation by i2CAT



3.6.3.1.1. Lightfield Capture

PRESENCE's high-quality volumetric capture relies on light field cameras. A light field camera, also known as a plenoptic camera in the scientific literature, captures 2D and 3D information with a single camera, through a single lens in a single, without the need for special illumination or markers. This makes them well-suited for capturing humans in natural motion and significantly reduces the complexity and number of cameras required in a professional capture setup. The original concept is often attributed to the Franco-Luxembourgish physicist and Nobel laureate Gabriel Lippmann in 1908. However, it took nearly a century to transform this concept from a scientific curiosity into a proficient 3D camera, necessitating the advancement of several key technologies in optics and computational photography.

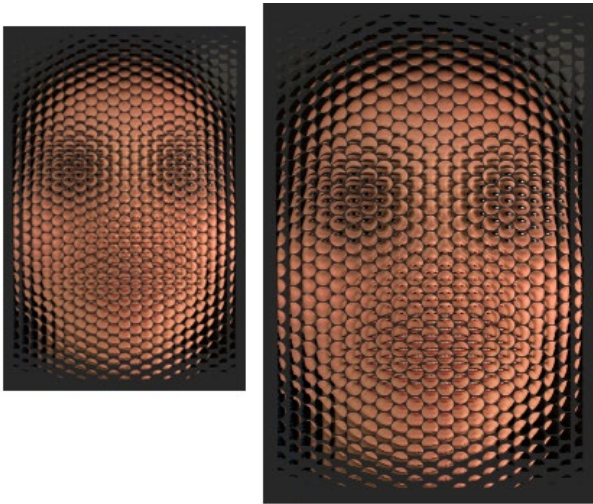


Figure 6: Raw lightfield image



Figure 7: Reconstructed 2D image and 3D model

Every lens captures a three-dimensional scene. However, 2D cameras lose depth information when the 2D image sensor intersects the 3D scene. Light field cameras use an array of microlenses to capture different perspectives and recover depth information computationally. Conventional light field implementations suffer from low resolution.

3.6.3.1.2. Volumetric Reconstruction

The reconstruction module of our holoportation system is responsible for creating 3D photo-realistic models (holographs) of people and objects in the scene in real-time.



Figure 8: Volumetric reconstruction



With its cutting-edge technology it provides several key-features to both end users and VR/XR/AR developers like photo-realism, real-time creation of 3D reconstructed bodies, modularity, connectivity with Unity and a simple and concise SDK for seamless incorporation of the module to the developer's use case.

The module offers end users an immersive experience through photorealistic and lifelike representations, enhancing the realism and engagement in AR/VR applications. This high visual quality is beneficial for immersive storytelling, educational simulations, and virtual tours. Real-time 3D reconstruction allows users to interact with dynamic holographic models instantly, improving communication and collaboration in virtual training and design. For VR/XR/AR developers, the module's SDK provides real-time processing for immediate feedback and the flexibility to customize the reconstruction pipeline, accommodating various user setups, enhancing application performance, modularity, and Unity connectivity.

3.6.3.2. Digital touch

Assuming that hand and body touch provides a truly immersive experience, interactions between humans, and with objects that multiple users are interacting with, is a main interest in PRESENCE. The challenge to face for improving haptics in multiuser experiences is threefold:

- Match different haptic modalities and fidelities with each other.
- Real time and rendering and generation of haptic data.
- The complexity of creating compelling haptic experiences and generating haptic data.

3.6.3.2.1. Haptic gloves

Developed by SenseGlove, this device allows to deliver vibrotactile and force feedback to the user. This technology aims to give the chance to interact in VR naturally by feeling the size, stiffness and resistance of virtual objects, unlike current controllers.



Figure 10: Skinetic haptic vest by Actronika



Figure 9: Nova haptic glove by SenseGlove



3.6.3.2.2. *Haptic vest*

Developed by Actronika, this device allows to deliver spatialized vibrotactile feedback across the user's torso. This technology aims to provide an enhanced immersion in the virtual environment to the user, by providing congruent tactile sensation in link with the different interactions and events.

3.6.3.2.3. *Haptic engines*

Haptic engines generate the haptic signals and sensation in order to display them through haptic devices (gloves & vest). Two approaches are developed by Actronika and Interhaptics, aiming to provide tools for developers in order to simplify the design and integration workflows.

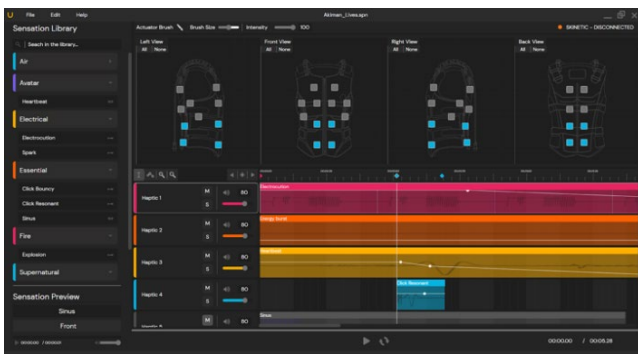


Figure 12: Unitouch Studio by Actronika



Figure 11: Haptic Composer by Interhaptics & Razer

3.6.3.3. *Virtual Humans*

Virtual humans are digital representations designed to mimic human behaviours and appearances. Within the PRESENCE project, their primary purpose is to facilitate social interaction, collaboration, and training in XR environments by representing users and others through realistic 3D models created by customization or from simple camera setups. To this end, the project aims to capture facial expressions, body poses, and voice to provide high-fidelity, fully animatable virtual humans that overcome current limitations and provide seamless, intuitive communication to enhance user interactions with virtual humans in VR.

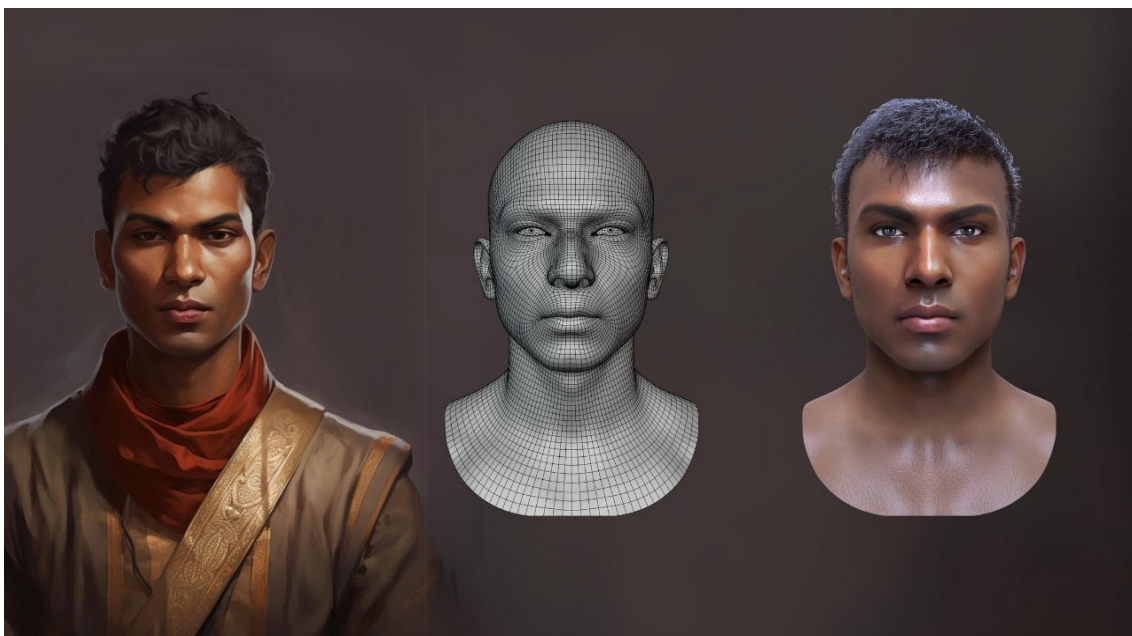


Figure 13: Example of virtual humans



3.6.3.3.1. Smart Avatars

Smart avatars are virtual representations of users that can be facilitated to interact in virtual environments. The PRESENCE project aims to provide personalized, realistic virtual humans of users generated through accessible camera setups. These avatars are intended to replicate users' facial expressions, body movements, and voices, ensuring accurate and dynamic representation and to leverage AI technology to react naturally to user inputs and environmental conditions. The goal is to facilitate effective social interaction, collaboration, and training in XR by creating avatars that adapt and respond believably to various virtual scenarios. By improving the fidelity and interactivity of these avatars, PRESENCE aims to overcome current technological limitations and provide a more immersive user experience.

3.6.3.3.1. Intelligent Virtual Agents (IVAs)



Figure 14: The working of IVAs

Intelligent Virtual Agents (IVAs) are advanced virtual humans capable of independently understanding and reacting to user inputs like speech, gestures, and facial expressions to simulate natural communication and interaction. Within PRESENCE, the purpose of IVAs is to enhance the realism and interactivity of XR environments by including natural and believable interactions with virtual humans. This involves processing verbal and non-verbal cues using neural networks and machine learning, enabling IVAs to exhibit realistic emotional and social behaviours, and realistic physics-based animations. The project focuses on developing IVAs that can dynamically respond to social rules and physical constraints, utilizing AI to predict and synthesize actions and emotions, and analysing group behaviour to improve collaborative experiences. Hence, the provided functionality allows for the efficient customization of IVAs for specific use cases, bridging the gap between narrow and general AI applications.

3.6.4. The Minimum Viable Product

A Minimum Viable Product (MVP) is a version of the product with just enough features to be usable by early customers and users, who can then provide feedback for future development. This iterative process ensures that we build a product that truly meets market needs and expectations. Based on our current insights it is too soon to formulate the PRESENCE MVP(s). In the first Joint Business Clinic and second user validation and exploitation cycle (M10-M20) (see Figure 2: PRESENCE methodology for user validation and exploitation) our preliminary insights and value proposition(s) will be formed, analysed, and (in)validated by advisors, business experts, and potential customers through comprehensive feedback and testing.

These outcomes will provide us with the needed insights into the desirability and viability of PRESENCE that address the core problems of specific user groups. This will guide us in refining and bringing the product to market.

In D6.2 this section will be updated with newly validated customer and user insights and data. We will focus on topics such as key features, unique selling points, and the technical specifications to



be included in the PRESENCE MVP. To facilitate this process the consortium will use the MVP canvas and method designed by Bram Kanstein.⁵

3.7. Component and IP Management (component 5)

The component tracker is essential for the successful exploitation of the PRESENCE project as it provides a clear and organized understanding of the contributions from each participant and how these components integrate to create the overall solution. By meticulously documenting each attribute of PRESENCE, including the specific components, their owners, detailed descriptions, dependencies, and potential exploitation opportunities, the tracker ensures that no aspect of the project is overlooked. This comprehensive overview is critical for identifying and assessing all exploitable results, thereby enabling the consortium to strategize effectively and maximize the project's impact and opportunities for exploitation.

Moreover, the component tracker serves as a dynamic, continuously updated tool that adapts to new insights and opportunities as they arise. By facilitating regular validation through Work Package meetings, one-on-one discussions with consortium partners, and consortium-wide meetings, the tracker ensures that our exploitation strategies remain relevant and robust. This iterative approach allows us to refine our understanding of user needs, pain points, and jobs-to-be-done, thereby aligning our components with market demands.

Ultimately, the component tracker will guide us in developing validated exploitation opportunities, ensuring that our solutions are market-ready and poised for successful commercialization, effectively productising (individual) features or elevating features to become full-marketable products.

For an overview of our current, and work-in progress, component tracker see Annex IV: Component Tracker. Based on this initial version we aim to identify further options for (joint) exploitation and develop effective strategies. Our initial, unvalidated ideas on exploitation opportunities are included, with the goal of having a better understanding of opportunities for each component by M18.

3.8. Results consolidation with human-centred approach (component 6)

PRESENCE prioritizes customer and user needs to ensure our solution is designed and marketed effectively. By M36, deliverable D6.3 will consolidate results from our human-centred approach to exploitation and business development, evaluating the potential impact on various user groups and addressing ethical and societal implications to ensure the solution is socially responsible and sustainable. This step will guide the future development and commercialization of the PRESENCE solution, for a more in depth overview I refer to Section 3.1 Methodology and especially 3.1.2 Feasibility, Desirability, and viability.

For now, it suffices to state that the current deliverable (D6.1) provides insights into the human-centred activities and strategy that will be deployed during the PRESENCE project. Over the next 18 months, we will focus on our pathway to identifying the 'sweet spot' of PRESENCE (see Figure 3: The 'sweet spot'). The initial outcomes of this can be read in D6.2, to be ready by M18. To achieve this, we will answer and validate the following questions:

- **Desirability:** Are we addressing the right pain points?
- **Feasibility:** How can we build PRESENCE to strengthen our product/service?
- **Viability:** Does our business model align with how customers want to use and pay for our solution?

⁵ Kanstein, B. (n.d.). The MVP Experiment Canvas. Retrieved from: <https://themvpcanvas.com/> (last visited on February 22, 2023)



3.9. Capacity building and workshops

The consortium's capacity-building strategy is strategically designed to address the need for enhanced digital skills across Europe. Central to this strategy is the objective of contributing to the uptake of digital skills through the provision of comprehensive training and courses aligned with the outcomes of PRESENCE. The consortium seeks to empower a diverse range of participants, including young researchers, students, and professionals, with future-ready skills.

PRESENCE aims to enable participants to have a better understanding and skills of immersive technologies and their applications, human-centred design and user-centric business development, and guidance on the use of PRESENCE SDKs. Through these workshops and tutorials participants will hopefully be able to integrate PRESENCE into their workflows, be able to develop products & services with European values in mind and have a better understanding of immersive technologies.

To guide our efforts, we will develop a capacity building-framework, to be validated with consortium partners. This framework, and the initial capacity building activities, will be shown in D6.2. The capacity building-framework will consist of two dimensions. First, we distinguish whether our efforts concern general capacity development or specific skill development related to the use of PRESENCE. The second dimension is a planning dimension: in which year of the project, we plan to do the activity. Our aim is to reach over 300 participants that participate in (e-)meetings, workshops, and (e-)learning modules, with PRESENCE user-engagement aiming to reach a potential audience of over 3,000 end-users.

PRESENCE coordinator Sergi Fernandez Langa (I2CAT) has delivered an inspiring presentation on PRESENCE during the ACM International Conference on Interactive Media Experiences (IMX) 2024 at the Interaction and Storytelling with(in) Immersive Media (ISIM) Workshop, which we proudly co-organized. The ISIM workshop included 50 participants and explored the vast potential of emerging immersive media technologies and how they revolutionize content creation and interaction. The PRESENCE presentation focused on PRESENCE technologies such as holoconferencing and Point Cloud & Depth Compression.



Figure 15: PRESENCE's coordinator at ISIM workshop during IMX24



Furthermore, PRESENCE is co-organizing the *International Summer School on eXtended Reality Technology and eXperience* to be held on July 8 - 11, 2024 in Madrid. The International Summer School on eXtended Reality Technology and eXperience aims to provide both an objective and clear overview and an in-depth analysis of the state-of-the-art research in eXtended Reality.⁶

3.10. Concluding remarks on exploitation

This section has given an overview of our proposed exploitation strategy for PRESENCE. Our aim was to provide a clear and effective plan for realizing the project's results and maximizing their benefits for customers and markets through Human-Centred Design. To achieve this, we have outlined PRESENCE's methodology for user validation and exploitation - consisting of 3 consecutive 10-month cycles, with an additional 6-month period for results consolidation. Through this methodology we aim to lay the foundation for future market opportunities. In the current, and first, cycle (M0-M10) we're validating interest in the market for PRESENCE and if the problem we're solving is a problem that needs to be solved according to the market. Furthermore, we've introduced six components that are essential for identifying the appropriate value proposition(s). Through this approach we can maximize the benefits of our solution for customers and partners while also positioning ourselves for future growth and success.

The PRESENCE exploitation strategy will begin by defining current needs, how we could deliver benefits to customers and markets in the future, and how it could be jointly commercialized and monetized. We believe that our exploitation approach will lay the foundation for future market opportunities. As the XR market continues to evolve and grow, we anticipate a growing demand for solutions that enable real time, low latency, and touch enabling solutions that benefit interaction across different stakeholders, such as trainers and trainees or medical professional and patient. In the first year and leading up to D6.2 we will validate interest in the market by selected target segments, if the problem we are currently solving is indeed the problem that these target segments need a solution for, and asses initial feasibility. Leading up to, and based on, the first Joint Business Clinic we will formulate and further validate our insights on user types and co-create with them on initial value propositions. Ensuring a two-way engagement with the market that allows us to build not only the right thing, but to build the thing right as well. In the second cycle and year, leading up to D6.2 we will move towards validating the above activity and data and will have begun looking at ways for PRESENCE to create revenue and analyse the willingness to pay amongst the above user types and stakeholders of the Joint Business Clinic.

The important next steps leading up to D6.2 will be:

- **Organize the First Joint Business Clinic:** We will organize our first Joint Business Clinic and use results to validate current insights on the value proposition, target segments, and Business Model Canvas. Participants will co-create potential concepts to understand how PRESENCE can address their current or upcoming problems within the next three years.
- **Validate the Business Model Canvas:** Conduct Joint Business Clinic and Consortium Meetings to validate the initial Business Model Canvas, ensuring it aligns with market demands and user needs.
- **Refine the Value Proposition:** Use feedback from users, experts, and market analysis to define and refine the preliminary value proposition(s), making it more targeted and compelling for the identified customer segments.
- **Create Individual Exploitation Plans:** Develop Individual Exploitation Plans for each consortium member and map joint exploitation opportunities based on this data.

⁶ For a complete overview of what the Summer School has to offer please visit https://www.qti.ssr.upm.es/summer_school/



- **Update the Component Tracker:** Continuously update and validate the component tracker through Work Package meetings and one-on-one discussions with consortium partners, ensuring it reflects the latest opportunities and dependencies.
- **Design Capacity Building Framework:** As WP6, design a standardized capacity-building framework for learning modus and select and create the first of five eLearning modules for capacity building related to the PRESENCE solution.
- **Create MVP Canvas:** Define and develop a Minimum Viable Product (MVP) using the refined value proposition and validated component tracker.

4. Dissemination and communication

The main objective of the D6.1 Dissemination and Communication section for the PRESENCE project is to outline a strategic roadmap for steering communication and dissemination efforts throughout the project's duration. The plan outlined in this section defines specific objectives, chosen tools and channels, as well as the timing and execution of activities. The plan emphasizes the importance of evaluating the impact of dissemination and communication efforts to continuously refine and enhance our strategy.

Furthermore, all consortium partners are integral to the execution of dissemination and communication initiatives, contributing content, publications, event participation, and the promotion of project outcomes to engage stakeholders strategically. This document serves as a practical guide for aligning on strategic objectives and operational activities within the consortium. It also represents a shared understanding of the key factors that the consortium and the European Commission must coordinate to effectively promote the project's achievements and impact.

Our strategy leverages multiple communication tools, such as social media platforms, a dedicated project website, and physical events, to effectively promote and disseminate the project's goals and outcomes. Our efforts have led to increased awareness of the PRESENCE project within the XR community and the establishment of an online community around the project's activities. Moving forward, we will expand and intensify these activities to maximize impact and engagement throughout the project's lifecycle. This section provides an overview of our current and upcoming dissemination and communication activities.

4.1. Specific objectives

The "Dissemination and Communication" efforts within the PRESENCE project serve a dual purpose—not only to generate general publicity but also to conduct targeted dissemination to specific, yet-to-be-defined stakeholder groups. A cornerstone of these endeavours is the development of a coherent narrative that lays a solid and comprehensible foundation for our explanation and communication strategy.

01	Develop targeted strategies to engage stakeholders, industry professionals, and end-users effectively.
02	Create compelling narratives to articulate the significance of PRESENCE's research findings in clear and engaging ways.
03	Promote the adoption of PRESENCE's innovations within industry sectors and stakeholder communities to facilitate technology transfer.
04	Refine communication strategies through a continuous feedback loop using analytics and stakeholder input for continuous improvement.
05	Monitor the impact of dissemination activities and adjust strategies based on feedback and performance indicators for effective evaluation.

*Table 5: Dissemination and Communication objectives*

4.2. The PRESENCE dissemination & communication strategy

The communication and dissemination strategy for PRESENCE aims to engage a diverse interdisciplinary audience and foster support for the project, with the goal of expanding awareness and adoption of its innovations. This strategy will involve informing and engaging research institutions, consortium partners, XR industry representatives, and stakeholders in industries like tourism and health. Through comprehensive communication efforts, PRESENCE will highlight the tangible successes of its technologies beyond prototyping, making XR technologies appealing to those outside the field. The strategy will emphasize the interconnectedness of XR with industry, science, and culture, cultivating a growing audience across platforms over the project's duration. Success will be assessed through regular monitoring and evaluation of predefined key performance indicators (KPIs).

The communication content will be tailored to our target audiences, focusing on industries such as news media, tourism, engineering, manufacturing, healthcare, and entertainment. Social media platforms like LinkedIn, Instagram, YouTube, and X, as well as newsletters and scientific publications, will be utilized to disseminate project updates and engage with audiences. Our inaugural social media campaign, 'Meet-the-Partners,' is celebrating each institution participating in the project, highlighting their unique contributions and roles. In future campaigns, consortium members will be introduced through social media to humanize and personalize PRESENCE. During key events, such as the general assemblies, we will conduct interviews with consortium members to provide deeper insights and firsthand perspectives. Public events and publications will further amplify the project's visibility and impact.

Key milestones will be shared through various channels to provide insights into project development, showcasing our progress and highlighting significant achievements. This will include detailed updates on technical advancements, breakthrough innovations, and collaborative efforts, presented in an engaging and accessible manner. These milestones will be shared not only to inform but also to inspire our audience, demonstrating the tangible impact and future potential of the PRESENCE project. By doing so, we aim to maintain a continuous narrative of success and evolution, keeping our stakeholders informed and invested in our journey.

To ensure the success of our dissemination and communication efforts, we are targeting a broad range of groups, including academic researchers, industry professionals, tourism and health professionals, and the general public. We are focusing on these groups because they represent the key stakeholders who can drive the adoption and implementation of PRESENCE's specific XR technologies in various sectors. Academic researchers will benefit from our technological advancements and research findings, industry professionals will see practical applications and business opportunities, tourism and health professionals will understand the practical applications in their fields, and the general public will become more aware of the benefits and possibilities of XR technologies in telepresence, holoportation, virtual humans, and haptics.

To reach these groups, we will employ a multi-faceted approach. For academic researchers, we will publish our findings in scientific journals and present at conferences. Industry professionals will be engaged through targeted social media campaigns, industry events, and webinars. Tourism and health professionals will be reached through tailored workshops, demonstrations, and partnerships with relevant organizations. The general public will be engaged through accessible content on social media, public demonstrations, and media coverage. By using these tailored approaches, we aim to effectively communicate the value and potential of the PRESENCE project to all relevant stakeholders.

As part of our comprehensive dissemination and communication strategy, we have developed several key documents to facilitate and coordinate the effective dissemination of the PRESENCE project's outcomes. These documents are essential tools for ensuring that our communication efforts are organized, targeted, and impactful. Below are the descriptions of these critical documents:



- **Publications Calendar:** The Publications Calendar is a meticulously curated schedule that outlines potential conferences and journals where the scientific outcomes of the PRESENCE project can be disseminated. This calendar serves as a strategic guide for consortium members, helping them to identify and plan for opportunities to present research findings and innovations to relevant scientific communities. By aligning our publication efforts with key events and deadlines, we aim to maximize the visibility and impact of our work within the academic and professional spheres.
- **Events Calendar:** The Events Calendar is a collaborative tool where partners can add any potential networking events, workshops, conferences, or other gatherings they plan to participate in. This calendar ensures that all partners are aware of upcoming opportunities to communicate and promote the PRESENCE project. By participating in these events, we aim to engage with diverse audiences, foster new collaborations, and enhance the visibility of our project. The calendar helps in coordinating efforts, avoiding overlaps, and ensuring a continuous presence at significant industry and academic events.
- **Blog Post Calendar:** The Blog Post Calendar is an organized schedule that assigns different partners the responsibility of authoring a blog post each month. These blog posts will be uploaded on the project's website and will cover a range of topics, including descriptions of partners' work, technical advancements, societal impacts, and other informative pieces aimed at the general audience. This initiative not only provides regular updates on the project but also ensures that a variety of perspectives and insights are shared, enriching the content and engaging a broader audience. The blog posts will be crafted to be accessible and engaging, helping to demystify XR technologies and highlight their relevance and benefits.

These calendars are integral to our dissemination and communication strategy, ensuring that our efforts are well-organized, timely, and effective. By leveraging these tools, we aim to enhance the reach and impact of the PRESENCE project, engaging with a wide range of stakeholders and fostering a deeper understanding and appreciation of XR technologies. Detailed versions of these calendars can be seen in Annex VI: Publications calendar, Annex VII: Events Calendar, and Annex VIII: Blog-Post calendar.

To maintain the effectiveness of our dissemination and communication strategy, we will implement a continuous feedback loop utilizing analytics and stakeholder input. By regularly monitoring engagement metrics from social media platforms, website traffic, event participation, and publication reach, we can assess the impact of our activities in real-time. Additionally, soliciting direct feedback from our stakeholders, including academic researchers, industry professionals, and the general public, will provide valuable insights into their needs and perceptions. This data-driven approach will allow us to refine our strategies dynamically, ensuring that our communication efforts remain relevant, impactful, and aligned with the evolving interests and requirements of our target audiences. Through this continuous improvement process, we aim to maximize the reach and influence of the PRESENCE project, driving greater awareness and adoption of our innovative XR technologies.

Our strategy also includes forming partnerships with other projects, institutions, and organizations to broaden the impact of PRESENCE. Collaborative efforts will enhance knowledge sharing, resource pooling, and cross-promotion, amplifying the project's reach and effectiveness.

Regarding dissemination to a wide scientific, industrial and business audience we will organise, starting in years 2 and 3 of the project, online seminars ([webinars](#)) where partners can present their research findings. These seminars will be organised in conjunction with a scientific journal, such as [Frontiers in Virtual Reality](#) and will be the initiation of a call for papers for a Research Topic. Some of the partners have successfully done this before, [sometimes attracting thousands of attendees](#) to the talks, where various partners [discuss different aspects of the project](#). The plan would be to have one such seminar series during years 2 and 3, and one call for papers for a [Frontiers Research Topic](#) based on the themes of the project by month 30.



The consortium will attempt to run a workshop or tutorial at a major conference such as [IEEE VR](#) (we say ‘attempt’ because the proposal may not be accepted) in the final year of the project. These give the opportunity for project members to present their results to other researchers and professionals in the field. Such events can also be combined with demonstrations. Consortium members have experience in organising [such events](#).

The consortium will also hold a PhD Students’ Mini Conference, where PhD students involved in the project take the lead and organise their own conference. They will receive advice, of course, from the more senior members of the consortium. But they will learn the whole process of initiating the conference through calls for papers, organisation of keynotes, assigning reviewers, reviewing the papers, forming the organisational committee, organising the programme, and actually running the conference. This will also be carried out in year 3. At this time we do not wish to determine the extent to which the conference would be public, but this will be left to the students to decide.

Ultimately, the communication strategy aims to cultivate an interdisciplinary audience and highlight the holistic ecosystem of XR, bridging industry, science, and culture through deliberate engagement with targeted audiences.

4.3. Communication tools

The dissemination and communication strategy for PRESENCE encompasses both online and offline approaches to engage diverse audiences effectively. Offline activities will focus on interactive events and engagements, including trade fairs, conferences, workshops, and tutorials, designed to foster interaction and knowledge exchange within relevant communities. These face-to-face interactions will provide invaluable opportunities for stakeholders to experience the project’s innovations first-hand, exchange ideas, and build lasting professional relationships.

However, considering the ever-growing effect the digital world has upon us, the online strategy plays a pivotal role. This strategy is structured around general tools such as newsletters and the project website, providing comprehensive information and updates. The website will serve as the central hub for all project-related content, featuring detailed descriptions of the project's goals, use cases, progress updates, and downloadable resources. Additionally, social media platforms will be utilized strategically to amplify project visibility, engage with stakeholders, and share project milestones and insights.

4.3.1. Visual Identity

An integral part of our communication strategy is the visual identity of PRESENCE, encapsulated in our logo. The logo is designed to represent human presence while also conveying a sense of looking ahead. This dual symbolism reflects our commitment to enhancing human interactions through advanced XR technologies. The color palette of the logo is intentionally soft, representing the human



Figure 16: Logo PRSENCE

LOGO VERSIONS



Figure 17: Logo variations



aspect and the warmth of human presence. In contrast, the futuristic font of the letters symbolizes our mission to forge new paths and innovate within the XR industry. Moreover, the logo represents the boundaryless nature of the project, illustrating how we aim to bring people together and break all boundaries, connecting individuals across various contexts and environments.

This thoughtful combination of elements ensures that our logo not only resonates with our audience but also effectively communicates the essence of the PRESENCE project.

To ensure the logo meets diverse needs, we created several versions, including ones with a white background, horizontal layout, and variations without text. These adaptations ensure that our branding is versatile and can be effectively used across different mediums and formats, maintaining consistency and recognition in all our communications.

4.3.2. Online tools

4.3.2.1. General tools

The general toolkit for communication ensures a cohesive and visually consistent presentation of the PRESENCE project across all Consortium members' platforms and at official and public events.

A template for presentations and deliverables has been created to ensure a consistent visual appearance among consortium partners. A unified design identity has been established, encompassing a logo, colour palette, and font selection. Content that adheres to this visual identity is created on demand to ensure consistency across all materials, including slides, banners, brochures, and rollups.

4.3.2.2. Website

The project's official website, <https://presence-xr.eu> serves as a central hub for navigating project activities and expanding stakeholder networks. It acts as the primary gateway to comprehensive information about the project's ecosystem, featuring news updates, use-cases updates, and consortium-generated awareness content. Structured into five key sections, the website ensures easy access to essential project elements:

- **Home:** Offers an introduction to PRESENCE, outlining project objectives, vision, and presenting the consortium. It facilitates newsletter subscription and social media engagement as well as giving an overview of our latest news.
- **News:** Offers timely updates, articles, and press releases about the project's latest developments and achievements in XR technology. Here, visitors can explore insightful content, including blog posts and announcements, providing valuable insights into the project's progress and impact. Utilizing tags like "blog post" and "newsletter", we streamline navigation, making it easier for visitors to access specific types of content.
- **About us:** Details our vision and presents the leading team of PRESENCE. An additional subsection is planned where the whole team participating in PRESENCE will be showcased.
- **Consortium:** Provides an overview of the diverse partners involved in the project, spanning across various sectors and expertise areas. Visitors can navigate to individual organization websites for a deeper understanding of each partner's role, fostering transparency and collaboration.
- **Project outcomes:** A concise overview of the project's achievements. Divided into two subsections, it provides easy access to project deliverables and publications, showcasing the tangible results and scholarly contributions of the PRESENCE project.



4.3.2.3. Social media tools

Social media plays a critical role in engaging and convincing our target stakeholders of the significance of the PRESENCE project, ensuring it remains top-of-mind throughout its duration. It serves as our primary channel to communicate the project's message, sharing timely, relevant, and interactive updates across all social media platforms.

Partners within the PRESENCE consortium will actively participate in dissemination efforts, collaborating on content creation, translating information into national languages, and sharing project updates from their own social media channels.

Our social media presence will be instrumental in raising awareness about the project and positioning PRESENCE as a leader within the European extended reality ecosystem.

1. **LinkedIn:** [PRESENCE](#)

- Introduce the consortium members of the project to give PRESENCE a face and showcase the consortium as a whole.
- Utilize LinkedIn as a platform to disseminate regular updates on the progress of the PRESENCE project, alongside pertinent industry news and insights.
- Share thought leadership content authored by consortium members to position PRESENCE as a leading authority in the XR industry.

2. **Instagram:** [presence_xr](#)

- Our strategy on Instagram is to provide a visually compelling narrative of the advancements achieved within PRESENCE. By curating captivating visuals and informative captions, we aim to showcase the transformative potential of XR technology in reshaping human-machine interactions.
- Engaging with our audience is paramount to our strategy. By actively responding to comments, inquiries, and contributions, we foster a sense of community and collaboration around PRESENCE. Through meaningful interactions, we invite stakeholders to join us on this journey of exploration and discovery.

3. **YouTube:** [PRESENCE](#)

- Leverage YouTube as a platform to disseminate comprehensive content about the PRESENCE project. Our channel will feature extended videos offering deep dives into various aspects of the project, including interviews with consortium members, detailed demonstrations of XR technologies, and extensive coverage of project events. As outlined in the proposal's KPIs, we commit to producing a minimum of two videos, providing valuable insights and engaging storytelling about our project.

4. **X:** [presence_xr](#)

- On X, our strategy is two-fold: to amplify our presence on other platforms and to foster connections with stakeholders across all relevant groups like health workers, industries, the cultural sector and companies interested in professional collaboration.
- Firstly, we'll use X as a hub to promote our presence on platforms like LinkedIn, driving traffic to our professional network where we share regular updates and thought leadership content. By cross-promoting content and engaging with our audience on X, we'll expand our reach and maximize visibility across multiple channels.
- Secondly, X will serve as a platform for building meaningful connections with stakeholders in the XR community. Through targeted outreach and engagement, we'll connect with industry professionals, researchers, and enthusiasts, fostering collaborations and partnerships that drive innovation in XR technology.

Our social media strategy for PRESENCE is structured around three key components:



- **Owned Social Media:** These are the primary accounts managed directly by PRESENCE, such as our official LinkedIn page (PRESENCE) and our Instagram account (presence_xr). These platforms will be the main channels for sharing project updates, insights, and achievements.
- **Shared Social Media:** This includes social media accounts owned by our project partners. Although these accounts are not branded as PRESENCE, they will be instrumental in disseminating relevant content and extending our reach to a wider audience through collaborative efforts.
- **Earned Social Media:** This refers to the organic coverage and engagement generated by external sources such as the general public, bloggers, and influencers. This includes online word-of-mouth, viral trends, mentions, shares, reviews, and reposts. The networks of our partners will also help amplify the information shared by our official accounts, broadening our audience and impact.

By leveraging these three components, we aim to maximize the visibility and effectiveness of our communication efforts, ensuring that PRESENCE reaches and engages its target audiences comprehensively. Through targeted campaigns and strategic collaborations, we want to reach diverse communities, stakeholders, and end-users, fostering a strong and engaged network around our project.

4.3.3. Offline

In addition to our online communication strategy, the PRESENCE project will also harness the power of offline channels to disseminate and communicate our objectives and achievements effectively. We recognize the value of physical event participation and organization, including trade fairs, workshops, conferences, and meet-ups, as invaluable opportunities to engage with stakeholders and showcase our project. These efforts will be complemented by a range of printed communication materials tailored to the needs of each target group, ensuring clear and engaging messaging. Standard materials such as flyers, posters, videos, testimonials, and stories, all bearing the distinctive PRESENCE logo and funding acknowledgement, will be produced to convey our project's goals, achievements, and open calls outcomes to diverse audiences.

4.3.3.1. Promotional materials

At events, promotional materials play a crucial role in conveying detailed information about the developments achieved within the PRESENCE project. One of the key promotional materials is the official project leaflet, meticulously crafted to outline the project's use cases, technological pillars, and overarching goals. This leaflet serves as a comprehensive introduction to PRESENCE, providing attendees with a clear understanding of the project's scope and objectives. The leaflet can be found in Annex IX: Official Project Leaflet.

In addition to the project leaflet, we will create posters for each work package, highlighting the specific objectives, activities, and outcomes of each package. These posters serve as visual aids to engage event attendees and provide a deeper dive into the intricacies of each work package. Furthermore, a comprehensive poster outlining the entire project will be developed, offering a holistic overview of PRESENCE and its transformative potential in the XR industry.

We've also developed a visually appealing "Call for Participation" template (Annex X: Call for participation template), designed to attract end users and encourage their contribution of valuable insights and requirements. This template, consistent with our visual identity, serves as a powerful tool for our use case managers to engage stakeholders effectively.

4.3.3.2. Calendar of events

Building upon the previously mentioned event calendar (Annex VII: Events Calendar) PRESENCE will be represented at several key industry events throughout the project timeline. Our participation in these events will be meticulously planned and documented to ensure strategic alignment with our

project objectives. These events encompass a diverse range of networking opportunities, workshops, conferences, and other relevant gatherings within the XR community and related industries.

Events serve as vital offline communication tools, offering unique opportunities for direct engagement, knowledge sharing, and collaboration with stakeholders and industry peers. By actively participating in these events, we aim to showcase the progress and impact of the PRESENCE project, gather valuable feedback, and establish meaningful partnerships. Additionally, events provide a platform for us to engage with our target audience, disseminate project updates, and amplify our project's visibility on a global scale.

4.4. Timeline for communication and dissemination activities

Table 6 outlines a preliminary timeline for the rollout of the project's dissemination and communication activities during the initial two years of the PRESENCE project. This timeline serves as a foundational framework and will be continuously updated and refined in subsequent iterations of the communication and dissemination plan to adapt to evolving project milestones and objectives.

The timeline delineates key activities and milestones planned for each year, ensuring a strategic and phased approach to disseminating project outcomes, engaging stakeholders, and achieving communication goals. Regular updates and revisions will be incorporated into future versions of the communication plan to optimize our outreach efforts and align with project progress.

Dissemination & Communication activities	Year 1												Year 2											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Website																								
Social Media																								
Newsletters																								
Press Releases																								
Events																								
Videos																								
Scientific Publications																								

Table 6: PRESENCE Year 1 and 2 Dissemination and Communication timeline

4.5. Online actions report

The following numbers document the online activities from the beginning of the project to - June (i.e., the last day of the editing process for this deliverable).

4.5.1. Website PRESENCE

PRESENCE launched its website (<https://presence-xr.eu/>) in early May, ensuring a robust and comprehensive initial content upload to maintain momentum and engagement. Despite this late start we've seen steady traffic with 552 visitors since the start of the website. For a complete overview of our website traffic see Annex XII: Website statistics.

4.5.2. LinkedIn

From January 2024 to June 2024, our LinkedIn account gathered 1,192 page views and attracted 373 unique visitors, resulting in a follower count of 303. Of these, 74 followers are from within the consortium, bringing the total number of external followers to 229. This surpasses the KPI outlined

in our proposal. Analysis of visitor statistics during this period reveals that the majority of visitors were from research (24%), program and project Management (12.7%), and education (11.4%) fields.

These figures indicate that our content and campaigns are effectively engaging the target audience, with the potential to convert them into customers, partners, or supporters. By continuing to produce valuable content and fostering a robust community, our communications strategy can further leverage our LinkedIn presence to achieve our objectives and enhance awareness. To build on our success on LinkedIn, we plan to incorporate calls to action in our LinkedIn posts that encourage followers to join us on X and Instagram, thereby boosting our presence and engagement on these platforms.

4.5.3. Instagram

The project's Instagram account has made 5 posts but has gained momentum, indicating growing interest. Currently, the account has 42 followers, and Instagram's performance insights are limited at this stage. To expand its following and enhance visibility, the account will focus on engaging more with its audience, utilizing relevant hashtags, and collaborating with other industry-related accounts. These efforts aim to broaden its reach and cultivate a community around the brand. Additionally, increased collaboration with consortium partners' accounts holds significant potential to boost the follower count and overall awareness of the project's Instagram presence.

4.5.4. X

The project's X account has only recently begun its activity in June but has already shown promise. With a total of 600 impressions from 4 posts and 18 followers. While these early results are encouraging, there is still ample room for growth. By continuing to create engaging content and expanding the account's reach, the project can effectively leverage X to enhance its online presence and achieve its objectives.

4.6. Offline action reports

PRESENCE has actively participated in the ACM International Conference on Interactive Media Experiences (IMX) 2024 and its accompanying ISIM workshop, which the project co-organized. Through our engagement, we have showcased the project's advancements in immersive media technologies. Our coordinator delivered a presentation highlighting PRESENCE's innovative approaches to enhancing human interactions in virtual environments using eXtended Reality (XR) technologies. Additionally, the ISIM workshop provided a platform for collaboration and knowledge exchange among various HE projects, including TRANSMIXR and XReco. Our participation in these events underscores our commitment to advancing XR technology and fostering collaboration within the research community.

4.7. Concluding remarks on dissemination & communication

In summary, the PRESENCE dissemination and communication strategy has been meticulously designed to enhance the project's visibility and engagement across diverse platforms and audiences. By leveraging a blend of online and offline tools, PRESENCE aims to craft a cohesive narrative that underscores the project's objectives, progress, and achievements.

Through the approaches detailed in this document, aimed at effectively engaging various stakeholder groups—including academic researchers, industry professionals, tourism and health professionals, and the general public—we are poised to achieve our first objective. Strategies such as publishing in scientific journals, launching targeted social media campaigns, participating in industry events, conducting webinars, organizing tailored workshops, and hosting public demonstrations are strategically outlined. These initiatives are intended to foster deep engagement, disseminate project advancements, and cultivate awareness and interest in PRESENCE's innovative XR technologies across diverse sectors and audiences.



Our strategy emphasizes compelling storytelling across multiple platforms, such as social media, blog posts, and interviews during pivotal events, to humanize and personalize the PRESENCE project and resonate with diverse audiences. Through these storytelling efforts, PRESENCE aims to achieve its second objective.

By highlighting practical applications and demonstrating the transformative potential of XR technologies across diverse use cases, we aim to promote widespread understanding and acceptance of PRESENCE's advancements, facilitating effective technology transfer and integration into various sectors. This approach underpins our third objective.

PRESENCE refines its communication strategies through a continuous feedback loop using analytics and stakeholder input. By monitoring real-time engagement metrics and gathering direct feedback from stakeholders, we ensure our communication efforts remain relevant and impactful. This iterative approach allows us to adapt dynamically to the evolving needs of our audiences, maximizing the reach and adoption of our innovative XR technologies and fulfilling our fourth objective.

Finally, in achieving our fifth objective to monitor the impact of dissemination activities and adjust strategies accordingly, PRESENCE employs a rigorous approach of tracking KPIs and gathering feedback. This systematic evaluation ensures that our strategies are finely tuned to maximize effectiveness and adaptability. Continuously assessing performance indicators and listening to stakeholder insights will optimize our efforts to enhance visibility and drive meaningful engagement with our target audiences.

The initial results, such as the engagements on LinkedIn and Instagram, demonstrate a promising start, with targeted efforts planned to further enhance reach and impact. The strategic use of events and promotional materials ensures that the project remains in the spotlight, fostering meaningful interactions with stakeholders.

Looking ahead, continuous monitoring and adaptation of our strategy will be essential to sustain momentum and achieve the overarching goals of PRESENCE. By maintaining a strong and dynamic presence across all communication channels, the project is well-positioned to drive awareness, support, and adoption of its groundbreaking XR technologies.

5. Standardization

Standardization efforts will be a key output of the project as this will shape the future of haptics, MPEG and AI technologies standards through active participation and contribution of the involved partners. We can identify three major contributions areas in which the partners are active:

- **Light Field Representations:** Raytrix (RAYTRIX) will implement and contribute to the JPEG Pleno137 format for light-field, holographic, and point cloud data. This work addresses the volumetric format and represents the holoportation pillar of the project.
- **Haptics:** Interhaptics (INTER), SenseGlove (SG) and Actronika (ACTRO) are active members of the Haptic Industry Forum and INTER is also an active member of Khronos (OpenXR). Standardization in haptics is crucial for enabling device-agnostic social haptic interactions, benefiting both the consortium and the industry as a whole.
- **AI technologies (transversal):** JOANNEUM RESEARCH Forschungsgesellschaft (JRS) will continue its current work of co-chairing neural network compression activities. Their work will also contribute to standards for trustworthiness and validation, ensuring the reliability of AI for virtual humans within XR applications.

In the next section we will provide details on the different activities and participations in which the partners were involved.



5.1. Relevant standardization groups

Within the consortium we identified a number of standards to which PRESENCE can and will make substantial contributions. We provide below an overview highlighting events in which the partners were or will be involved.

Event	Type	Site	Date	Partner
OpenXR	Meeting	Bruxelles, Belgium	22-25 May 2024	INTER
MPEG146	Meeting	Rennes, France	22-26 April 2024	INTER, JRS
MWC	Conference	Barcellona, Spain	26 March - 1 April 2024	INTER
HIF - Haptics for VR working group	Meeting	Online	Ongoing Bi-weekly meeting	INTER, SG, JRS,
MPEG147	Meeting	Sapporo, Japan	[Planned] 15-19 July 2024	JRS
AWE 2024	Conference	Long Beach, USA	[Planned] 18-20 August 2024	INTER (RAZER)
Eurohaptics	Conference	Lille, France	[Planned] 30 June - 3 July 2024	INTER

Table 7: Standardization activities 2024

Project partners actively participated in various events and working groups, making substantial contributions to the advancement of key haptics standards.

At the OpenXR event (22-25 May 2024), Meta, in collaboration with Razer, submitted a proposal for updated OpenXR Haptics APIs. This exemplifies the project's commitment to fostering industry collaboration for standard development. Additionally, INTER, SG, JRS, and ACTRO actively participate in the bi-weekly Haptic Industry Forum (HIF) working group "Haptics for VR," shaping the OpenXR haptics standard through ongoing discussions and brainstorming. In the area of MPEG Haptics, INTER, alongside Interdigital, presented a prototype for streaming haptics during MWC. This collaborative work culminated in the release of the MPEG Haptics reference software (<https://github.com/MPEGGroup/HapticReferenceSoftware>), demonstrating the project's focus on driving innovation. To further propel adoption, INTER plans to showcase a prototype at Eurohaptics 2024 and AWE 2024.

JRS actively participated in MPEG meetings and their contributions include chairing the NN Compression (NNC) Ad Hoc Group (AhG). This group is finalising the 2nd edition of the NNC standard and the related conformance testing and reference software part until the end of 2024. Another activity in MPEG, that JRS is following, is on implicit neural video representations (such as NERFs or Gaussian splatting), which is working towards a Call for Proposals. In order to support this activity, a simple tensor coding profile of NNC is considered, and these plans will be further discussed during the upcoming MPEG meetings.

Concerning trustworthiness of AI, JRS is monitoring the activities in ISO/IEC SC42 and CEN/CLC JTC21 via the Austrian mirror committee and provided comments on draft documents and new work item proposals from these groups.

5.2. Standardization planning

To ensure effective collaboration and progress tracking, we have established two key communication channels: a bi-monthly meeting and a bi-monthly mailing tracking event. We describe below the objective of each activity.



- **Bi-monthly meeting:** These meetings serve as the project's standardization coordination hub, fostering collaborative planning and activity alignment. They provide a platform for partners to share ideas, discuss action plans, and ensure all efforts are strategically directed towards impacting standardization bodies.
- **Bi-monthly mailing tracking event:** This initiative facilitates continuous progress monitoring. Partners report on standardization activities undertaken in the preceding month. This practical information exchange keeps all parties informed of ongoing conferences, meetings, and advancements, enabling them to celebrate achievements and identify areas for collaboration.

This communication framework promotes ongoing alignment amongst partners on action points, ensuring clear understanding of past, current, and planned activities.

To keep track of each activity, a dedicated shared spreadsheet has been created (see Annex VIII: Blog-Post calendar).

5.3. Concluding remarks on standardization

This section showcases the tangible impact of project partners' active engagement in standardization efforts. Our collaborative efforts have demonstrably yielded significant progress. From co-developing OpenXR Haptic API updates to spearheading the development of the MPEG Haptics reference software, the project has fostered industry collaboration and driven innovation in haptics standardization.

Project partners have expressed their interest in participating in upcoming events such as Eurohaptics 2024 and AWE 2024. Additional outreach activities are currently under development and will be finalized during our upcoming bi-monthly meetings. These planned activities will be documented in the project tracking spreadsheet once details are confirmed.

These significant contributions solidify the project's position as a key player in advancing haptics and related standards. This success is built upon the extensive experience of several partners, who have actively participated in various standardization bodies for years.



6. Annexes

Annex I: KPI Tracker

		Project Month					M6	
		Select all	M1	M2	M3	M4	M5	M6
Category	Project Month KPI	Sum of Value	Progress					
<input type="checkbox"/> Brochure	Brochures distributed: 400	0,00	0%					
	No. of events where brochure is used: >5	0,00	0%					
	No.of Brochures: 2	1,00	50%					
<input type="checkbox"/> Factsheet	No. events where factsheet is used: >5	0,00	0%					
<input type="checkbox"/> LinkedIn	LinkedIn Group of 150 People	303,00	202%					
<input checked="" type="checkbox"/> Networking		0,00	0%					
<input checked="" type="checkbox"/> Newsletter		0,00	0%					
<input checked="" type="checkbox"/> Poster		0,00	0%					
<input type="checkbox"/> Press Releases	No.of Press Releases: 8	1,00	13%					
<input type="checkbox"/> Publication	2 publications (e.g. white papers) per project partner (# of partners reached)	0,00	0%					
	At least once a month an industry newsletter, article, or social media postings	6,00	17%					
	Publications in ≥2 journal special issues	0,00	0%					
	Publications in conference proceedings (>25)	0,00	0%					
	Publications in science journals (>13)	0,00	0%					
<input type="checkbox"/> Twitter	Number of re-Tweets and mentions > 150	6,00	4%					
	Number of Tweets > 150	2,00	1%					
	Number of Twitter Followers > 100	18,00	18%					
<input checked="" type="checkbox"/> Video		0,00	0%					
<input type="checkbox"/> Website	Average duration of website visits: 1:00 (per month)	0,00	0%					
	number of posts published on website > 50	4,00	8%					
	Number of website visitors by M12 > 700 (from M1)	552,00	79%					
<input type="checkbox"/> Workshop	(Co-)Organizing a minimum of 5 workshops and 2 tutorials with a participating audience of 20-60 people per event	1,00	14%					
	Participating in at least 8 (virtual) exhibitions in total	0,00	0%					

Figure 18: T6.1 KPI Tracking (table-form)

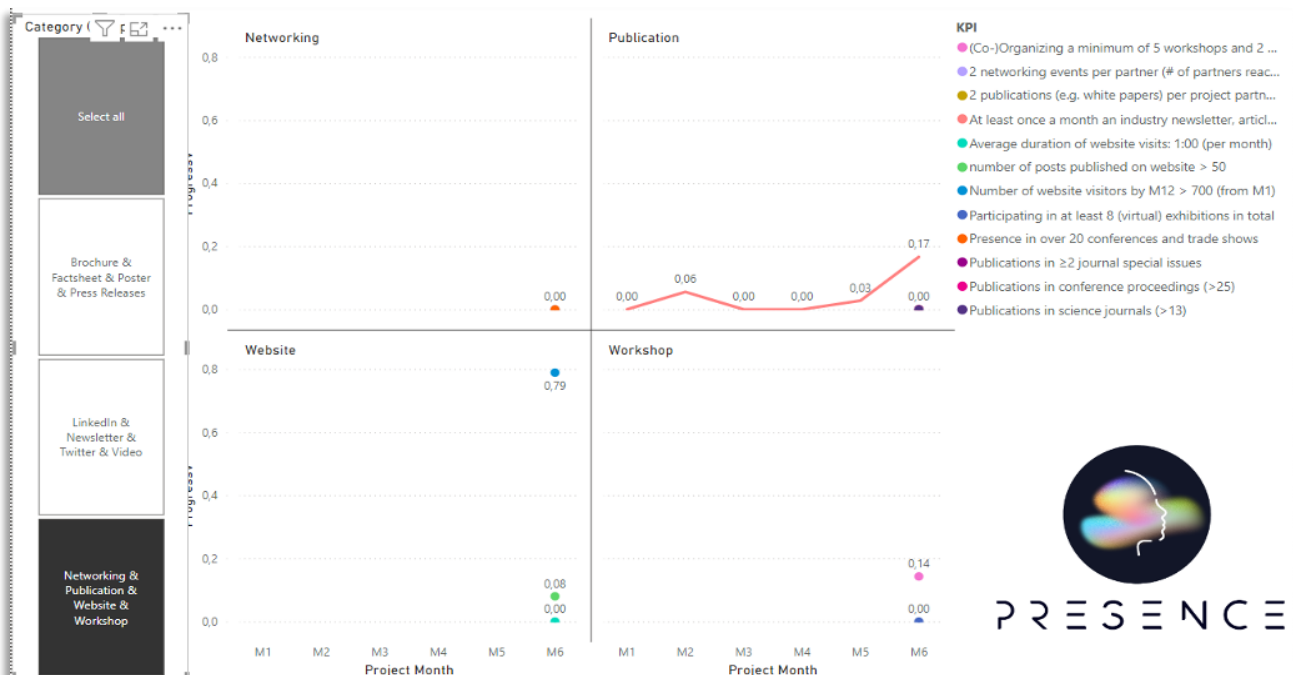



Figure 19: T6.1 KPI (visualised)

Task
Select all T6.2 T6.3 T6.4

Task KPI	Actual	Target	Progress
T6.2 Community of companies and organisations across Europe (>200)	38	200	19%
T6.2 Engage in cross-fertilization through commercial talks with at least 3 industry players in microelectronics, 5G/6G, edge/cloud computing, and AI.	0	3	0%
T6.2 Execute a permanent screening of the market in the most relevant fields of work of the project >6 updates (from M12 onwards)	1	6	17%
T6.2 Joint Business Clinics >3	0	3	0%
T6.2 present PRESENCE at relevant international conferences like Immersive Tech Week, Laval, MWC, WebSummit, SXSW etc.	1	10	10%
T6.3 (e-)meetings, workshops and (e-)learning modules (≥3)	1	3	33%
T6.3 (e-)meetings, workshops and (e-)learning modules reaching >300 participants that start an (e-)learning module.	50	300	17%
T6.3 Meetings with policy makers >4	0	4	0%
T6.3 Webinars, training and user engagement = aiming to reach a potential audience of over 3,000 end-users.	50	3000	2%
T6.4 Significant contributions to XR standards (at least 3 contributions).	0	3	0%
T6.4 Significant contributions to XR standards (over 10 meetings).	0	11	0%

Figure 20: T6.2, T6.3 & T6.4 KPI Tracking

Partner	Sum of # Articles	Min 2 articles	Sum of # Events	Min 2 Events
ACTRO	0	No	0	No
ARTANIM	0	No	0	No
CAP GEMINI	0	No	0	No
CERTH	0	No	0	No
DIDIMO	0	No	0	No
i2CAT	0	No	0	No
IMEC	0	No	0	No
INTER	0	No	0	No
JRS	0	No	0	No
RAYTRIX	0	No	0	No
SG	0	No	0	No
SOUND	0	No	0	No
SyncVR	0	No	0	No
UB	0	No	0	No
UHAM	0	No	0	No
UNITY	0	No	0	No
VECTION	0	No	0	No
ZAUBAR	0	No	0	No



You must first select a Partner to see detailed results

Figure 21: Tracking of partners obligations



Annex II: PRESENCE personas

II.i Professional collaboration

Harry



"I'm committed to integrating APIs for virtual humans, holoportation, and haptics to create immersive meeting environments that facilitate seamless communication and collaboration."

Harry has a background in software engineering with a focus on XR development. With extensive experience in creating immersive experiences, he specializes in applications for professional collaboration and meetings in XR. Harry is driven by the potential of integrating APIs for virtual humans, holoportation, and haptics to revolutionize how teams collaborate and communicate.

Name Harry
Age 30
Occupation XR Developer
Type Primary (direct user)
Role Developer

Motivations

- Transforming professional collaboration through immersive XR experiences.
- Contributing to advancements in XR technology for business applications.

Goals

- Develop immersive meeting environments that simulate real-world interactions through integrating virtual humans, holoportation and haptics APIs.
- Enable remote participation and presence through holoportation technology.
- Optimize XR applications for seamless and intuitive collaboration experiences.

Pain points

- Ensuring seamless integration of APIs
- Balancing realism and usability in XR experiences.
- Managing user expectations and adapting to evolving requirements in professional collaboration.

Behaviours

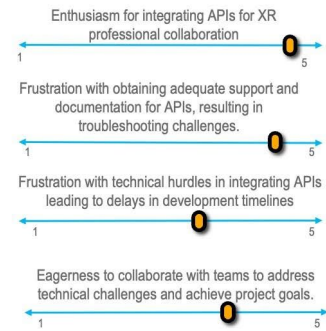


Figure 22: Persona Harry

Hanna



"Effective collaboration is the cornerstone of successful projects. I'm eager to explore how XR technology can elevate our team's productivity and innovation."

Hanna has been in the project management field for over a decade, leading cross-functional teams in various industries. She believes in leveraging technology to streamline collaboration and enhance team efficiency.

Name Hanna
Age 51
Occupation Project Manager
Type Primary (direct user)
Role Meeting Lead

Motivations

- Enhancing team collaboration and communication.
- Embracing innovative technologies to gain a competitive edge.

Goals

- Improve team collaboration through XR tools.
- Implement real-time project management solutions.
- Foster a culture of innovation within the team.
- Enhance workflow efficiency using immersive experiences.

Pain points

- Integrating XR tools with existing software systems.
- Addressing security concerns in virtual environments.
- Overcoming technical barriers in adopting new technologies.
- Managing the learning curve for team members new to XR.

Behaviours

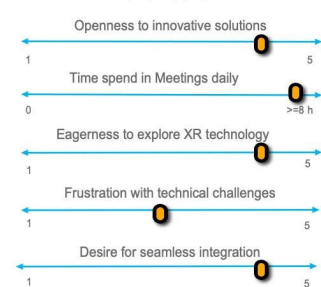


Figure 23: Persona Hanna



Daniel



"Innovation thrives on collaboration. I'm excited to explore how XR technology can break down barriers and foster creativity among our team members."

Daniel is a consultant with expertise in organizational development and change management. He believes in leveraging technology to drive collaboration and innovation within teams and across organizations.

Name Daniel
Age 38
Occupation Consultant
Type Primary (direct user)
Role Meeting participant

Motivations

- Exploring new technologies to improve client engagement.
Exploring new avenues for visualization and collaboration.

Goals

- Enhance client presentations through immersive XR experiences.
Collaborate effectively with remote team members.
Reduce travel costs and time associated with on-site meetings.

Pain points

- Resistance from clients and team members unfamiliar with XR technology.
Managing client expectations regarding virtual representations.

Behaviours

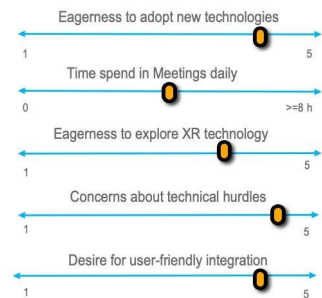


Figure 24: Persona Daniel

II.ii Manufacturing Training

Max



"XR has the potential to make professional training safer and more attractive. It can revolutionize how we learn professional skills and train new hires for manufacturing training."

Max has a background in computer science and AI with a specialization in XR technologies. He is passionate about creating immersive training applications for manufacturing.

Name Max
Age 40
Occupation XR Software Engineer
Type Primary (direct user)
Role XR Developer

Motivations

- Creating immersive applications that enhance training.
Pushing the boundaries of XR for manufacturing training..

Goals

- Develop multisensory XR training applications for manufacturing.
Integrate virtual humans, haptics and holoportation into XR applications for manufacturing training.

Pain points

- Overcoming technical challenges in creating immersive applications using virtual humans, haptics and holoportation APIs.

Behaviours

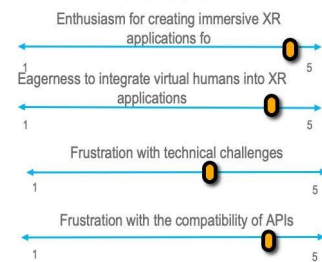


Figure 25: Persona Max



Karen



“Training is the foundation of a skilled workforce. I’m excited to explore how XR technology can revolutionize the way we onboard and train new employees in our manufacturing plant.”

Karen has over 15 years of experience working in manufacturing industries, specializing in training new hires and upskilling existing employees. She is dedicated to ensuring that workers have the skills and knowledge they need to excel in their roles.

Name Karen
Age 45
Occupation Manufacturing Trainer
Type Primary (direct user)
Role Trainer

Motivations

- Ensuring the effectiveness of training programs.
- Embracing new technologies to enhance learning experiences.

Goals

- Implement XR training simulations for new hires.
- Enhance safety awareness and compliance through immersive experiences.
- Streamline the onboarding process for new employees.
- Identify training gaps and performance issues among existing workforce.

Pain points

- Ensuring alignment between XR training content and learning objectives.
- Addressing resistance from employees accustomed to traditional training methods.
- Overcoming logistical challenges in deploying XR hardware and software.

Behaviours

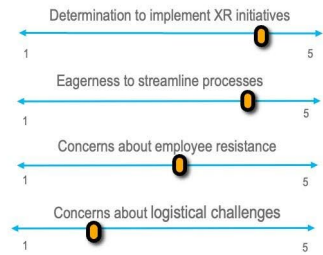


Figure 26: Persona Karen

Alex



“Joining this manufacturing team is a great opportunity for me to learn and grow. I’m excited to see how XR training can help me become proficient in my role.”

Alex recently graduated with a degree in mechanical engineering and has been hired as a production technician at a manufacturing plant. He is eager to learn the ins and outs of the industry and advance his career in manufacturing.

Name Alex
Age 25
Occupation Production Technician
Type Primary (direct user)
Role Trainee

Motivations

- Acquiring hands-on training and practical experience.
- Advancing career prospects in the manufacturing industry.

Goals

- Gain proficiency in operating machinery and equipment.
- Improve troubleshooting skills through realistic simulations.
- Ensure compliance with safety protocols and regulations.

Pain points

- Adapting to new XR interfaces and interaction methods.
- Ensuring alignment between virtual simulations and actual workplace conditions.

Behaviours

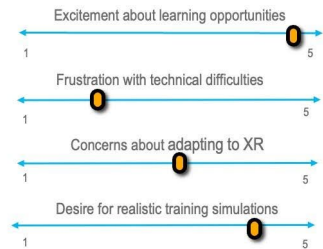


Figure 27: Persona Alex



II.iii XR Pain and stress relief

Maya



“Integrating APIs across haptics, holoportation, and virtual human technologies opens up endless possibilities for creating immersive XR experiences for health.”

Maya holds a master's degree in computer science with a specialization in human-computer interaction. She has extensive experience in developing XR applications for health care. Maya is passionate about leveraging emerging technologies to create immersive and acceptable experiences for pain and stress reduction.

Name Maya
Age 35
Occupation XR Developer
Type Primary (direct user)
Role Developer

Motivations

- Increasing user engagement with the therapy plans through XR technologies.
- Enhancing user experience in XR applications for health.

Goals

- Create multisensory immersive experiences for XR health.
- Integrate haptics, holoportation, and virtual human APIs into XR applications for health.

Pain points

- Overcoming technical challenges in integrating haptics, holoportation, and virtual human APIs.
- Ensuring usability and user acceptance of developed XR applications for health.

Behaviours

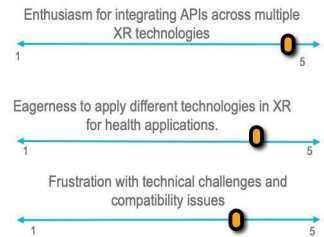
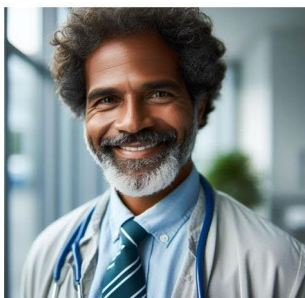


Figure 28: Persona Maya

Lucas



“Harnessing the potential of XR technology opens new avenues for stress and pain management. I'm excited to integrate it into our therapy sessions to offer more immersive experiences for my clients.”

Lucas has been practicing clinical psychology for over 20 years, specializing in stress and pain management through non-pharmacological interventions. He believes in the power of innovative technologies like XR to enhance traditional therapeutic approaches.

Name Lucas
Age 55
Occupation Clinical Psychologist
Type Primary (direct user)
Role Therapist

Motivations

- Improving traditional therapeutic interventions through XR.
- Enhancing patient engagement and adherence to therapy protocols.

Goals

- Integrate XR technology into therapy sessions to reduce stress and pain levels.
- Customize immersive experiences tailored to each patient's needs and preferences.
- Stay updated on the latest advancements in XR technology and therapeutic applications.

Pain points

- Overcoming potential resistance from patients unfamiliar with XR-based interventions.
- Addressing technical challenges and limitations of XR hardware and software.
- Balancing the integration of XR technology with established therapeutic techniques.

Behaviours



Figure 29: Persona Lucas



Sarah



“Managing stress and pain is a priority for me, and I'm willing to try new methods that offer relief. Exploring XR therapy seems like a promising avenue to address my challenges.”

Sarah has been struggling with chronic stress and pain due to the demanding nature of her job and personal life. She's open to exploring alternative therapies and innovative approaches to alleviate her symptoms and improve her overall well-being.

Name Sarah
Age 30
Occupation Marketing Executive
Type Primary (direct user)
Role Patient/Therapy receiver

Motivations

- Finding new strategies to cope with chronic stress and pain.
Improving overall quality of life and well-being.

Goals

- Reduce stress and pain levels through immersive XR therapy sessions.
Learn coping mechanisms and relaxation techniques tailored to her needs.
Improve emotional regulation and resilience to stress triggers.
Enhance engagement and commitment to the therapeutic process.

Pain points

- Potential discomfort or motion sickness while using XR hardware and software.
Managing expectations regarding the timeline and outcomes of XR therapy sessions.

Behaviours

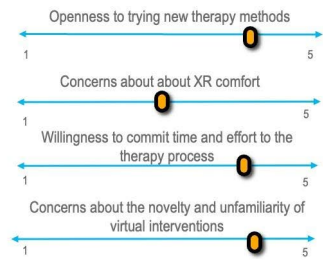


Figure 30: Persona Sarah

II.iv XR for cultural heritage

Anna



“XR can redefine tourism. I'm passionate about making our cultural heritage more accessible.”

Anna has a background in computer science with a specialization in computer graphics and 3D art. She has been fascinated by XR technologies and has dedicated her career to digitalizing cultural heritages to make them more accessible to a larger audience.

Name Anna
Age 25
Occupation XR Software Developer
Type Primary (direct user)
Role XR Developer

Motivations

- Make cultural heritage more accessible through XR.
Preserve cultural heritage through digitalization.

Goals

- Develop immersive experiences of cultural sites.
Integrate holoportation, haptics, and virtual humans APIs to make the virtual visit to the cultural sites more immersive.

Pain points

- Adapting and tailoring holoportation, haptics, and virtual humans APIs for specific touristic experiences such as visiting a historic site.
Balancing between interactivity of the XR experiences and the authenticity of cultural artifacts.

Behaviours

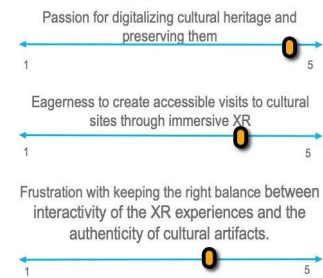


Figure 31: Persona Anna



David



“Cultural heritage is the thread that connects us to our past. I believe XR technology can help us weave richer narratives and bring history to life in ways we never imagined.”

David is a passionate advocate for preserving and promoting cultural heritage. As a museum curator, he is dedicated to educating the public about the history and significance of artifacts and monuments. He sees XR technology as a valuable tool for engaging audiences and making cultural experiences more accessible.

Name David
Age 45
Occupation Museum Curator
Type Primary (direct user)
Role Tour Guide

Motivations

- Educating and inspiring visitors about cultural heritage.
• Enhancing the museum experience through interactive technologies.

Goals

- Develop immersive XR tours and exhibits for museum visitors.
• Create engaging narratives that highlight the significance of cultural artifacts.
• Foster a deeper appreciation and understanding of cultural heritage.
• Reach wider audiences and make cultural experiences accessible to all.

Pain points

- Balancing technological innovation with preserving the authenticity of cultural artifacts.
• Ensuring inclusivity and accessibility in XR experiences for diverse audiences.

Behaviours



Figure 32: Persona David

Sophia



“Exploring cultural heritage sites is like stepping into the pages of history. I believe XR technology can make these experiences even more immersive and accessible for everyone.”

Sophia is an avid traveler and history enthusiast. She loves exploring new cultures and learning about the rich heritage of different countries. As a graphic designer, she appreciates art and storytelling and is excited about the potential of XR technology to enhance cultural experiences.

Name Sophia
Age 22
Occupation Graphic Designer
Type Primary (direct user)
Role Tourist

Motivations

- Exploring and learning about different cultures and historical sites.
• Enhancing travel experiences through immersive technologies.

Goals

- Engage in immersive XR tours of cultural heritage sites.
• Learn about the history, art, and architecture of the places she visits.
• Capture and share memorable experiences with friends and family.

Pain points

- Concerns about the authenticity and accuracy of XR representations.
• Technical barriers and compatibility issues with XR devices and platforms.
• Balancing XR experiences with traditional travel experiences.

Behaviours

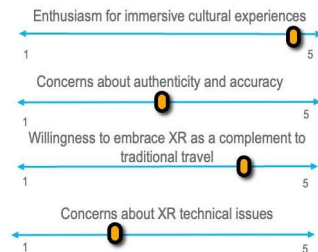


Figure 33: Persona Sophia



Annex III: Individual exploitation plan

Part 1: Exploitation

Exploitation Questionnaire

Please provide a description of an individual commercial exploitation plan. Please consider the following points:

- **General**
 - Have disruptive technological developments changed your plans for exploitation?
 - Have your initial plans evolved due to first insights gained from the latest Market Analysis (D6.1), the JBC#1 and potential contacts/collaborations arisen with external participants and/or following the efforts launched made in defining a joint exploitation strategy?
- **Market focus & Business plan**

Update the markets you plan to address. Especially put forward if your individual plans include those markets which have been pre-selected for the joint exploitation strategy?

 - Please provide an updated Business Model Canvas for your individual exploitation of the project result(s).
- **Commercialization strategy** *(as much as you can share about it)*
 - Have you undertaken any IP protection measures over the last months (e.g., patent applications, design rights, copyrights, NDAs etc.)?

How will you approach prospects/potential costumers (high-level sufficient)?

 - What are the timelines for going to the market?

Description of non-commercial project results

Apart from the core components of the native pipeline, a number of additional project outcomes (e.g., new knowledge, data, findings, and processes, etc.) will be generated within PRESENCE that could contribute to the delivery of positive impacts of the project for the research community, Standardisation Development Organisations, and could therefore create impact on society in general. After the project closure, these results shall be reused by project partners or other stakeholders, thus contributing to the development of new products and services and/or future research and innovation initiatives.

Please report below on the specific actions you plan to put in place to ensure that those valuable results will be made available for future exploitation.

RESULT	DESCRIPTION	EXPLOITATION MEANS	CO-OWNER(S)	IMPACT	NEXT STEPS
OTHER THAN THE CORE COMPONENT		HOW IS THE RESULT GOING TO BE USED? FOR WHAT ADDITIONAL APPLICATION AREAS?		EXPECTED FROM THE EXPLOITATION OF THE RESULTS	status



Part 2: Validation Questionnaire

- **Section A: Business Idea, Product & Services**
 - What does your organization expect to achieve with PRESENCE?
 - How will this benefit your organization? (Example: new products/services, joint/partnerships, strengthening position in market)
 - Does your organization have existing scenarios which could generate revenue with future PRESENCE solutions?
- **Section B: Markets & Customer**
 - Could you list the markets or customers where you intend to exploit the results from PRESENCE?
- **Section C: Partner's Exploitation Plan**
 - Do you already have ideas to exploit PRESENCE outcomes?
 - How can you turn your ideas into actual opportunities?
 - What steps do you need to take to do so?
 - How will partnerships develop during and after the project?
 - Do you have an idea of the potential profit for identified opportunities?
 - Does the PRESENCE project open further research and development?
 - Have you identified future funding from national/regional sources to support your further research and development ideas?
- **Section D: Commercial value**
 - What results could be implemented and exploited in commercial products? In new services? Or in strengthening your position in the market?
 - Do you have an idea of the commercial values or estimated growth in 1-2 years and 3-5 years?
 - Finally, how will the results from the project improve your own business developments?
- **Section E: Community value**
 - How will you share the newly gained knowledge and expertise with the external community?
 - How will your outcomes and standardization works be exploited by your organization?
- **Section F: IPR protection**
 - How do you intend to market your outcomes generated by PRESENCE? (I.e., patent IPR, collaboration agreement, open source, or else)



Annex IV: Component Tracker

	Attribute	Owner	Component	Description Technical Level	Description User Level
Holoportation					
Raytrix, CERTH, I2CAT	XR Capturer	Raytrix	Capturer SDK	The Light-Field SDK is a set of tools for processing light fields and integrating Raytrix's light-field camera. It encompasses camera controls, calibration, and spawns image processing units (IPUs) for processing light-field into various formats.	The Light-Field SDK converts light-field into usable RGBD data. A user-friendly calibration for light-field cameras will be available.
		Raytrix	R32 light-field camera	A light-field camera optimized for capturing high-resolution, 30fps+ light-field images of humans in confined spaces, featuring wide-angle lenses, high-bandwidth interface, and thermal stabilization.	A camera able to capture 3D light-field of humans.
	XR Reconstructor	CERTH	VolReco	Human reconstruction	Users experience a 3D reconstructed model of themselves either in pointcloud or 3D meshes representation
	XR Compressor	i2CAT	HoloMIT SDK	Unity Engine Package with DLL that enables volumetric reconstruction, compression, transmission and rendering.	Unity Package that enable multi-session and multi-user holoconferencing
		i2CAT	HoloCapturer	Collects the inputs from different cameras, it manages the frames from the devices and provides them as an input to HoloCuda	Dynamic library used for managing the capturing devices. The collected input is sent to the HoloCuda library for processing
		i2CAT	HoloCuda	Processes the provided frames and it offloads the	GPU-based Dynamic library for point cloud processing.



				work to the GPU and compute point clouds	
<i>XR Network</i>	i2CAT	Index / Resource Manager		Keeps track of the available / used in-cloud media components for forwarding, mixing and transcoding	In-cloud component in charge of keeping track and signaling the employed in-cloud components for communication and media processing
	i2CAT	Decision Maker		Balances workload of geometry provision by clustering the session in multiple player subsets, assigning each subset to a given SFU/MCU.	In-cloud component in charge of ensuring scalability and stability of multiuser sessions. Deploys multiple SFU/MCUs to leverage session workload
	i2CAT	SFU		Forwards geometry packets received from each player to the rest of players, all within a given session.	In-cloud component in charge of forwarding media streams from origin to destination clients. Forwards player provided geometry to rest of the sessionn players.
	i2CAT	MCU		Provides scenes per player at a given fps while applying level of detail to each player volume inside each scene.	In-cloud component in charge of forwarding media streams from origin to destination clients, by performing smart mixing and/or transcoding features. Creates scenes per player adjusting volumetry resolution.
<i>Virtual Humans</i>					
Didimo, UHAM, ARTANI M, JRS	<i>Virtual Human Generation</i>	Didimo	Face Random agent generation	Algorithms to generate a set of random fully-rigged virtual humans based on a description of parameters (e.g., gender, ethnicity, age range etc.)	
		Didimo	Face Photo to avatar	Algorithms to generate a fully-rigged virtual humans based on a facial photo of a user	Users can experience an avatar of themselves or somebody known from the picture
		Didimo	Character Editor (face/body/gar	Virtual human editing based on parameters	



			ments/accessories)		
Virtual Human Language Processing	UHAM	Speech-To-Text	Translates spoken language to written text	Users can communicate information to the virtual human within a voice interaction	
	UHAM	Text-To-Speech	Translates written text to spoken language	Users can perceive dynamically generated content expressed by intelligent virtual agents during voice interactions	
	UHAM	Natural Language Processing	Processes the content of a conversation and generates responses both on written text basis	Users can have a natural conversation with the virtual human	
Virtual Human Face Animation	UHAM	Lip-Sync	Synchronizing the virtual human's lips with its current voice output	User can see the virtual human's lips moving during an voice interaction	
	UHAM	Facial Expression	Animating the facial expression of a virtual human according to the user's face (smart avatars) or according the interaction content (intelligent virtual humans)	User can have more natural interaction with virtual humans.	
	UHAM	Eye Movement / Eye Blinks	Implements eye movement and eye blinks either by eye-tracking (smart avatars) or by algorithms (intelligent virtual humans) to realize a more natural user interaction	User can have more natural interaction with virtual humans.	



Virtual Human Body Animation and Locomotion	ARTANIM	Kinematic Imitator (state-based physics controller)	Re-implementation of DReCon algorithm in Unity3D using the Mujoco Physics Engine. Example demo scenes combining path-finding and Motion Matching with DReCon	This kind of physics controller is trained to follow a kinematic movement. In practical terms it means that the interactive part (locomotion, grasping an object, turning the head, etc.) is dealt with kinematic methods (inverse kinematics, motion matching, etc.). The contribution of the physics controller is to comply with physical constraints (inertia when turning, bumping on obstacles, etc.)	
	ARTANIM	Sensorimotor Controller (non-state-based physics controllers)	In progress, not yet settled on the algorithmic details	Sensorimotor controllers work through pure perception-action loops. The interactive reactivity of the character is achieved directly by the physics controllers. It is a much more technically challenging problem (this means that the interactivity needs to be introduced within the training procedure), but can potentially give more flexible controllers.	
Recognition, Detection, and Tracking (Human, Emotion, and Object)	JRS	Human action recognition [to be developed]	Real-time recognition of a human's action from a 2D video		
	JRS	Facial emotion recognition [to be developed]	Real-time emotion recognition from a user's face (potentially wearing a head-set)		
	JRS	Object detection and tracking [to be developed]	Real-time object detection and tracking (e.g. of a face, or certain tool) from a 2D video. Employ open-set (zero-shot) object detector for adding new classes without retraining.		
<i>Demonstrators</i>					
UNITY, VECTIO N,	Demonstrator Template	Unity Technologies	"Unity Presence Scenario"	Allows creators to develop PRES immersive scenarios	Creators use it in Unity to create PRES immersive experiences



SyncVR , ZAUBA R	Vection Technology	Immersive Collaboration Experience	Use the technology of haptic gloves, Virtual humans and holoportation to create a multiuser Manufacturing experience to execute a training scenario. Users will interact using haptic gloves to touch the environments, holoportation to have a more realistic representation of the people, and the IVA for a easy interaction with the training	Users can execute and/or evaluate training in a more immersive environment through the holoportation and the haptic feedback. They will also have the help of an Intelligent Virtual Agent that can help them with the training itself in a natural speech interaction
	Vection Technology	Immersive Training Experience	Use the technology of haptic gloves, Virtual humans and holoportation to create a multiuser Professional collaboration experience to design an armchair. Users will interact using haptic gloves to touch the environments, holoportation to have a more realistic representation of the people	Users can interact with each other in a more immersive environment letting them to feel the sensation of the objects, and with a more realistic environment
Pain Relief Demonstrator	SyncVR Medical	Haptic relax & distract	Use sensor data from haptic gloves and haptic vest to increase immersion in distracting/relaxing experience for patients during medical interventions	a) Patients: the most immersive experience to distract them from and relax during medical procedures b) Healthcare staff: a time-saving method to treat the most anxious patients
	SyncVR Medical	Ava	Use human avatar interaction to increase immersion in distracting/relaxing experience for patients during medical interventions, using an Intelligent Virtual Avatar to inform and instruct patient throughout the intervention	a) Patients: the most immersive experience to distract them from and relax during medical procedures b) Healthcare staff: a time-saving method to treat the most anxious patients



		SyncVR Medical	Buddy	Use holoported familiar person (friend/family, "buddy") inside the VR environment to maximise relaxation and distraction and minimise pain/anxiety experience. The buddy comforts the patient with words (i.e. voice audio) and gestures.	<p>a) Patients: decrease pain/anxiety experience by interacting with familiar person to become more relaxed</p> <p>b) Healthcare staff: saving time by being able to focus on intervention while Buddy comforts the patient</p>
Tourism Demonstrator		ZAUBAR	Holistic Location-Aware Experience (for touristic and educational purposes)	<p>Combine Avatar and Character Creation, Speech and Language Processing, Facial and Body Animation, Recognition and Emotion Analysis and Visual Perception and Tracking with immersive storytelling and straightforward UX for a user-friendly experience releasable to test groups.</p> <p>Technology: Partners' APIs, Partners' Hardware, Unity, ZAUBAR CMS, Apple Vision Pro)</p>	<p>Tourists are able to relive the experience of fleeing through the tunnel going from 1980s East to West Berlin.</p> <p>Tour guides and time witnesses are able to communicate the experience from those times in a more meaningful and immersive way.</p>

Table 8: PRESENCE Component Tracker



Annex V: Business Model Canvas

v.i Holoportation

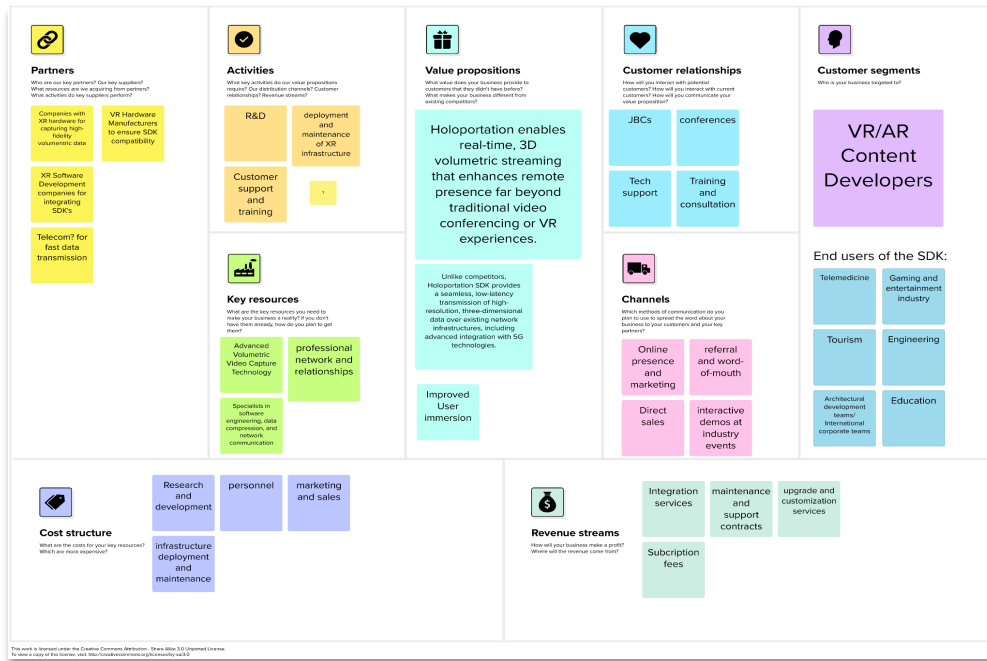


Figure 34: BMC Holoportation

v.ii Haptics

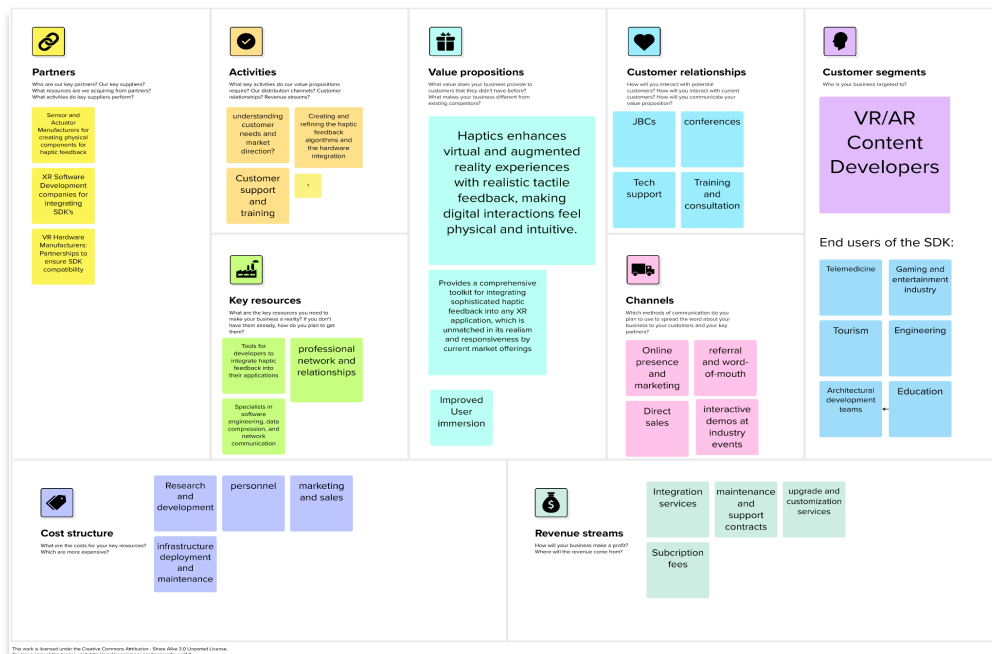


Figure 35: BMC Haptics



v.iii Virtual Humans

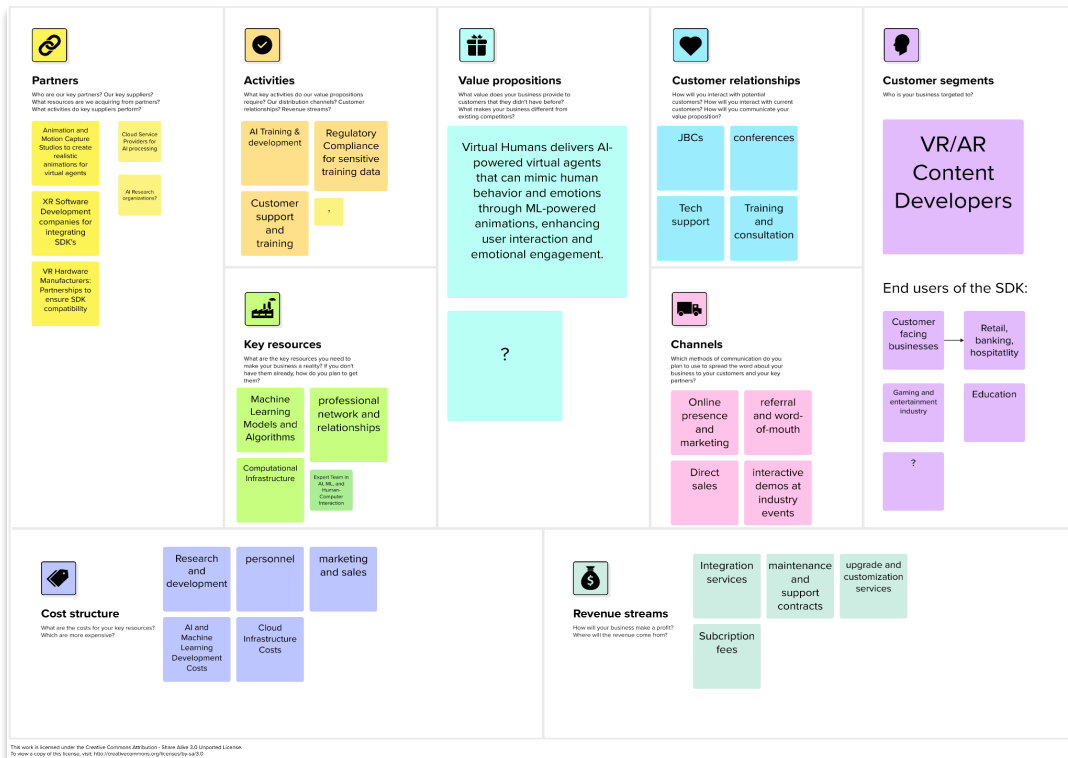


Figure 36: BMC Virtual Humans



Annex VI: Publications calendar

Publications Calendar

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17

Today is: 6/7/2024
Month: Jun
Year: 2024

KPI 6.3: Contribute tangible advances in the XR domain, evidenced by at least 25 conference proceedings

Name	Conference Date	Paper Submission Deadline	Location	Full Name	Rank	Participation by Partner	Website
CVMi 2024	10/19/2024	4/15/2024	Prayagraj, India	3rd IEEE International Conference on Computer Vision and Machine Intelligence			https://cvmi2024.iiit.ac.in/
3DBODYTECH	10/22/2024	4/30/2024	Lugano, Switzerland	"World's largest meeting entirely dedicated to 3D & 4D body scanning and processing technologies"			https://3dbody.tech/conference.html
WACV 2025	2/28/2025	6/21/2024	Tucson, Arizona	IEEE/CVF Winter Conference on Applications of Computer Vision	A		https://www.thecvf.com/
ACCV 2024	12/8/2024	7/2/2024	Hanoi, Vietnam	Asian Conference on Computer Vision	B		https://accv2024.org/
3DV 2025		8/7/2024	TBA	International Conference on 3D vision			
CVPR 2025	6/10/2025	11/7/2024	Nashville, Tennessee	International Conference on Computer Vision and Pattern Recognition	A	Maybe Artanim	https://www.thecvf.com/
ICCV 2025	10/19/2025	1/7/2025	Honolulu, Hawaii	International Conference on Computer Vision	A		https://www.thecvf.com/
IEEE VR 2025	3/8/2025		Saint Malo, France	IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR)	A	Presumably UHAM, Maybe Artanim	https://ieeerv.org/2025/
ACM CHI 2025	4/26/2025	9/12/2024	Yokohama, Japan	ACM Human Factors in Computing Systems (CHI)			https://chi2025.acm.org/
IEEE ISMAR 2024	10/21/2024	5/3/2024	Seattle, Washinton	IEEE International Symposium on Mixed and Augmented Reality (ISMAR)	A	UHAM with TVCG Paper	https://ieeesmar.org/
ACM VRST 2024	10/09/2024	06/17/2024	Trier, Germany	30th ACM Symposium on Virtual Reality Software and Technology (VRST)	A	Perhaps UHAM	https://vrst.hosting.acm.org/vrst2024/
ACM ICMi 2024	11/04/2024	05/10/2024	San Jose, Costa Rica	26th ACM International Conference on Multimodal Interaction (ICMI)	?		https://icmi.acm.org/2024/
ACM IVA 2024	09/16/2024	04/16/2024	Glasgow, Scotland	24th ACM International Conference on Intelligent Virtual Agents (IVA)	?		https://iva.acm.org/2024/
ACM IUI	03/24/2025	10/09/2024	Cagliari, Italy	30th ACM Conference on Intelligent User Interfaces (IUI)	?		https://iui.acm.org/2025/
ACM CUI	07/08/2024	02/29/2024	Luxembourg City, Luxembourg	6th ACM Conference on Conversational User Interfaces	?		https://cui.acm.org/2024/
ACM MIG 2024	11/21/2024	7/19/2024	Austin, USA	ACM SIGGRAPH Motion, Interaction, and Games 2024	?	Maybe Artanim	https://smiq.hosting.acm.org/mig-2024/
SIGGRAPH ASIA 2025	08/01/2025	12/01/2025	Singapore? Unclear	The 18th ACM SIGGRAPH Conference and Exhibition on Computer Graphics and Interactive Techniques in Asia	?	Maybe Artanim	https://asia.siggraph.org/2024/
SIGGRAPH	07/28/2025	01/01/2025	Vancouver, USA	ACM SIGGRAPH Conference and Exhibition on Computer Graphics and Interactive Techniques in Asia	A	Maybe Artanim	https://s2024.siggraph.org/
ICRA	05/23/2025	09/15/2024	Atlanta USA	international conference on robotics and automation		Maybe Artanim (or the following year)	https://2025.ieee-icra.org/
Eurographics	09/28/2025	05/12/2025	London	45th Annual Conference of the European Association for Computer Graphics and Interactive Techniques	?	Maybe Artanim	https://eog25.cs.ucl.ac.uk/
ACM SIGGRAPH 2024	07/28/2024	01/12/2024	Denver, USA	SIGGRAPH 2024 - Special Interest Group on Computer Graphics and Interactive Techniques 2024	A	DIDIMO	https://s2024.siggraph.org/

2 Conferences Journals

Figure 37: Publications calendar



Annex VII: Events Calendar

Dissemination activities & events

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1								
2	Today is: 6/10/2024	-KPI 6.2: Achieve presence in over 20 conferences and trade shows						
3	Month: Jun	-(Co-)organising a minimum of 5 workshops/displays and 2 tutorials with a participating audience of 20-60 people per event, participating in at least 8 (virtual) exhibitions.						
4	Year: 2024	-Pursue clustering activities with other EC-funded projects focusing on social XR.						
5		Event	Date	Organised by	Location	Full Name	Participation by Partner	Link
6		ISIM Interaction and Storytelling with(in)	6/6/2024	IZCAT et al.	Stockholm, Sweden	Interaction and Storytelling with(in) Immersive Media Workshop. ISIM Workshop at ACM IMX 2024	IZCAT PRESENCE Presentation	https://transmix.eu/isim-workshop/
7		International Summer School on eXtended Reality Technology and eXperience	11/6/2024	UPM, IZCAT et al.	Madrid, Spain	International Summer School on eXtended Reality Technology and eXperience	IZCAT, Organizing committee. No presentation. Plan for year 2 would be to present demo and test PRESENCE technology	https://www.gti.ssr.upm.es/summer-school/
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Figure 38: Events calendar



Annex VIII: Blog-Post calendar

The screenshot shows a Google Sheets spreadsheet with the following data table:

Blog-post planning						
Month/Week	M4 April 2024	M5 May 2024	M6 June 2024	M7 July 2024	M8 August 2024	M9 September 2024
Week 1	-	I2CAT/SG	DIDIMO	Capgemini	TBA	TBA
Week 2	-	ACTRO	IMEC	ZAUBAR	TBA	TBA
Week 3	Sound/CERTH	UHAM	JRS	CERTH	TBA	TBA
Week 4	INTER/UB	Raytrix/ARTANIM	SyncVR	SOUND	TBA	TBA

Figure 39: Blog-Post calendar



Annex IX: Official Project Leaflet

PARTNERS

Presence XR is a Horizon Europe Innovation Project co-financed by the EC under Grant Agreement ID: 101135025

FOLLOW US

www.presence-xr.eu

in @PRESENCE
 @presence_xr

A TOOLSET OF HYPER-REALISTIC AND XR BASED INTERACTIONS

PRESENCE is dedicated to revolutionizing human interactions in virtual environments by enhancing the concept of presence in eXtended Reality (XR) experiences through innovative technologies and interdisciplinary research.

PRESENCE offers tangible solutions to real-world challenges.

Whether you're a healthcare professional seeking **innovative approaches to patient care**, a company looking to **enhance employee learning experiences**, a team needing immersive **professional collaboration tools**, or adventurous travellers yearning for **immersive virtual destinations**, PRESENCE promises to transform the way you interact with digital environments and unlock new possibilities in XR technology.

USE CASES

Professional collaboration
Experience immersive professional collaboration: virtually convene, discuss, and evaluate design concepts with remote colleagues using XR technology.

Manufacturing Training
Step into the future of training as you immerse yourself in a virtual world, mastering machine operation under expert guidance.

Cultural Heritage
With XR technology, explore historical events firsthand alongside virtual guides and witnesses. Experience the tension, make pivotal decisions, and rewrite the past through immersive storytelling.

Health
Alleviate patient anxiety during medical procedures through immersive XR experiences. Receive personalized support and distraction, enhancing comfort and reducing stress.

TECHNOLOGICAL PILLARS

Holoportation
how to create realistic visual interactions among remote humans, delivering high-end holoportation based on live volumetric capturing, compression and optimization techniques, under heterogeneous computation and network conditions

Haptics
how to provide realistic touch among remote users and synthetic objects, developing novel haptic systems and enabling spatial multi device synchronisation in multi user scenarios

Virtual Humans
how to produce realistic social interactions among avatars and agents, generating AI virtual humans, representing actual users or AI agents.

Figure 40: Official Project Leaflet



Annex X: Call for participation template

DATE

WORKSHOP TYPE

PRESENCE

JOIN US

RESHAPE XR TECHNOLOGY

WHO?
 Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.

WHAT?
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WHERE?
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Additional information
 Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Apply for participation with this QR code...

<https://presence-xr.eu/>

email

phone number

Presence XR is a Horizon Europe Innovation Project co-financed by the EC under Grant Agreement ID: 101135025

Figure 41: Call for participation template



Annex XI: Deliverable and slideshow templates




PRESENCE

A toolset for hyper-realistic and XR-based human-human and human-machine interactions, PRESENCE

Grant Agreement n° 101135025
 HE Call identifier: HORIZON-CL4-2023-HUMAN-01-CNECT
 Topic: HORIZON-CL4-2023-HUMAN-01-21
 Type of action: HORIZON Research and Innovation Actions



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<input checked="" type="checkbox"/>	SEN	Confidential, only for members of the consortium (including the Commission Services)

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Commented [AR1]: If the dissemination level is PU (Public), mark PU in the table above, make it bold and remove the bold on SEN and remove this disclaimer.

















Figure 42: Deliverable template

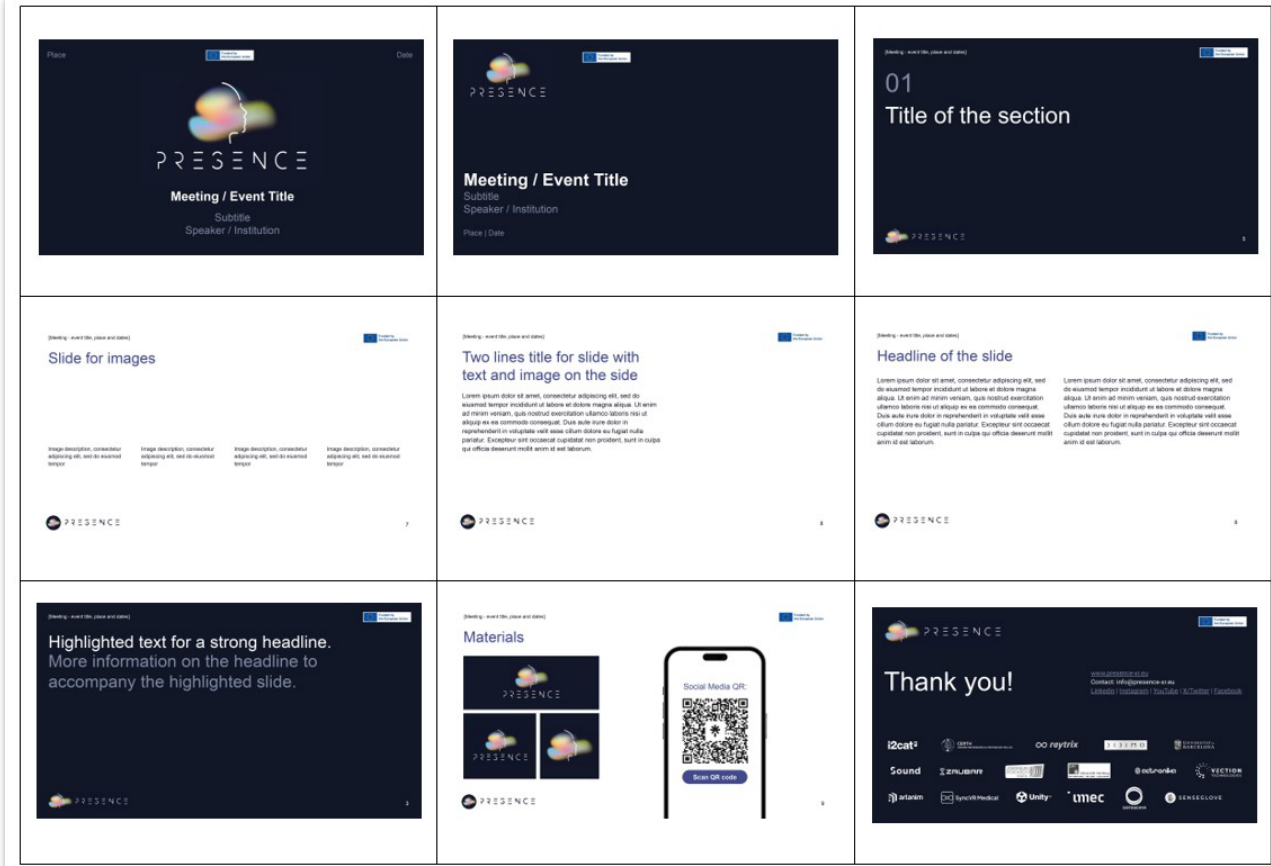


Figure 43: Slideshow template



Annex XII: Website statistics

Time	Visitors	Visits
Today	21	40
Yesterday	10	35
Last week	134	323
Last 7 days	223	488
Last 30 days	486	8,595
Last 60 days	552	8,856
Last 90 days	552	8,856
Last 12 months	552	8,856
This year (Jan-Today)	552	8,856
Last year	0	0
Total	552	8,856

Figure 44: Website statistics and traffic trend





Annex XII: Standardization Tracker

Event Name	Date	Participants (Who)	Partner	Type	Details (What has been done)
Open XR in person meeting Brussels	22-25 May	Eric Vezzoli	INTER	Meeting	Meta submitted a proposal co-developed with Razer for updated openXR Haptics APIs Submitted vendor ID MR for Razer Haptics Extensions
MPEG146 in person meeting Rennes	22-26 April 2024	Alexandre Hulsken, Werner Bailer	INTER, JRS	Meeting	INTER: Conformance code development +Reference code development JRS: Chaired NN Compression AhG, attended sessions for preparing CfP for implicit neural video representations
MWC Barcelona	26 Apr - 1 March	Eric Vezzoli	INTER	Conference	Presented a prototype of MPEG haptics streaming in partnership with Interdigital
MPEG147 in Sapporo [planned]	15-19 July 2024	Werner Bailer	JRS	Meeting	Chair NN Compression AhG, issues NNC ed2 reference SW and conformance, discussion on simple tensor coding profile to support eg coding of 3D Gaussian splatting
AWE 2024 [planned]	18-20 Jun	Razer as brand	INTER	Conference	Presented a prototype of MPEG haptics streaming in partnership with Interdigital
Eurohaptics 2024 [Planned]	30 Jun - 3 Jul	Eric Vezzoli, Detjon Brahimaj	INTER	Conference	Presented a prototype of MPEG haptics streaming in partnership with Interdigital
Haptic Industry Forum Haptics for VR working group	Ongoing bi-weekly meeting	Eric Vezolli, Alexandre Hulsken, Max Lammers, Gijs den Butter, Xavier de tinguy, Rafal.pijewski	INTER, SG, JRS, ACTRO	Meeting	Ongoing ideation of OpenXR haptics standard
MPEG Haptics reference software published	31-05-24	Alexandre Hulsken, Eric Vezzoli	INTER	Publishing	

Table 9: PRESENCE Standardization tracker



7. Abbreviations and definitions

7.1. Abbreviations

AhG	Ad Hoc Group
AI	Artificial Intelligence
AR	Augmented Reality
AWE	Augmented World Expo
BMC	Business Model Canvas
HCD	Human-Centered Design
HE	Horizon Europe
HIF	Haptics Industry Forum
IP	Intellectual Property
IPR	Intellectual Property Rights
ISO/IEC	International Organization for Standardization/International Electrotechnical Commission
IVA	Intelligent Virtual Agents
JBC	Joint Business Clinic
JPEG	Joint Photographic Experts Group
JTC	Joint Technical Committee
MPEG	Moving Picture Experts Group
MVP	Minimum Viable Product
MWC	Mobile World Congress
NNC	Neural Network Compression
ROI	Return on Investment
SDK	Software Development Kit
VPC	Value Proposition Canvas
VR	Virtual Reality
WP	Work Package
XR	eXtended Reality



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