RIT
REALITIES IN TRANSITION

REALITIES IN TRANSITION WHITE PAPER

FUTURE OF EXTENDED REALITIES: OPPORTUNITIES AND CHALLENGES

Co-funded by the European Union

Imprint

Aggregation of good practices for XR as a common, open, sustainable good. 2024.
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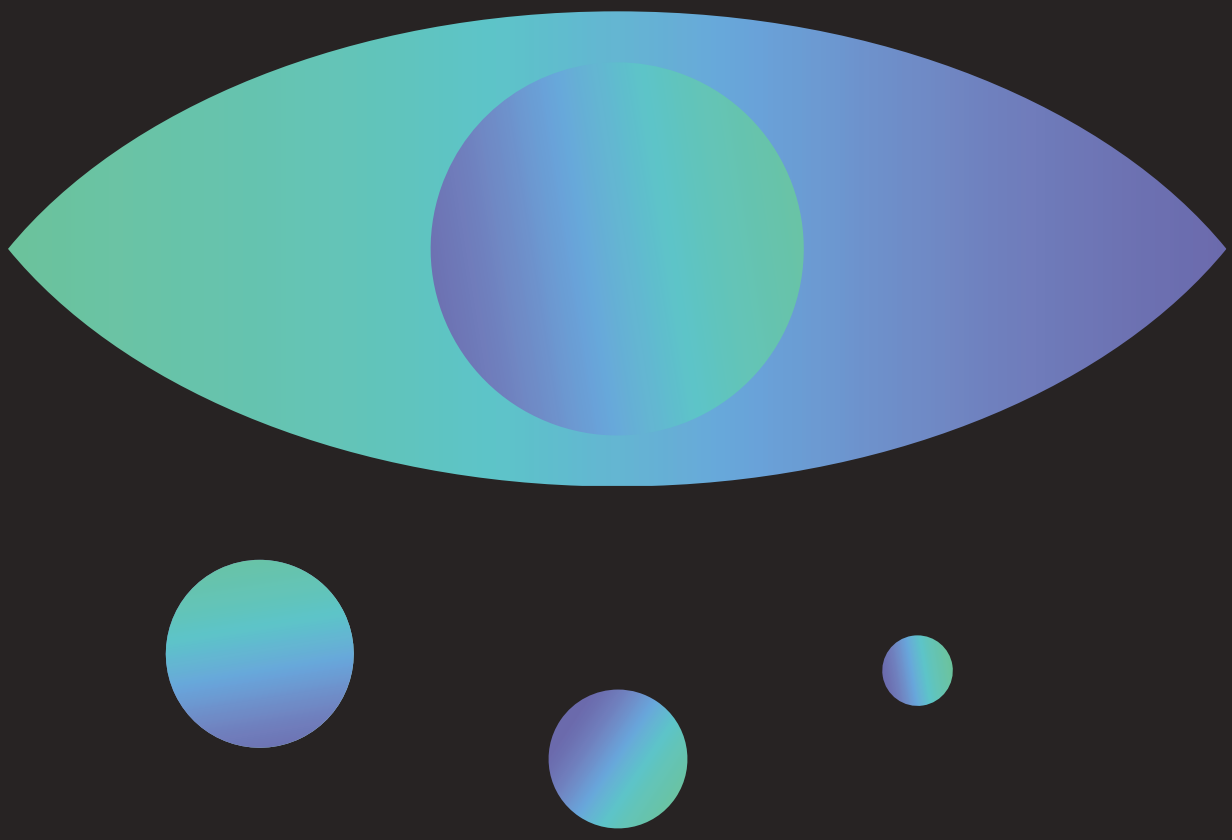

ABOUT *REALITIES IN TRANSITION*

Realities in Transition (RiT) is an international community that aims at both exploring and supporting alternative Extended Reality (XR) productions, and experimenting with new narratives and creative processes.

RiT aims at building a strong, independent European XR creative and activist community, a think tank to tackle current and future challenges in the digital sector.

We want to establish XR as a sustainable and inclusive tool for the common good.
→ RiT wants to consolidate and share XR related knowledge, tools, and methodologies.
→ RiT takes a critical look at XR, bringing together creation, curation, and dissemination practices with educational methods, and considering privacy, ethics, and sustainability issues.

We support alternative XR creation to promote new narratives.
→ RIT supports emerging XR creatives, artists, and projects to foster inclusive and sustainable practices for experimental XR creations.

We aim at consolidating the existing XR creative Community.
→ RiT creates opportunities for networking and peer-to-peer learning between existing independent and activist XR initiatives, XR artists, researchers, coders, cultural and creative sector professionals, decisionmakers, and the general public interested in XR in coming together to use XR as a common, open, and sustainable tool in their work.

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THE CONSORTIUM

Chroniques

Shaped by the contrast and diversity of its dual identity in Marseille and Aix-en-Provence, CHRONIQUES is a uniquely recognised international artistic event and a human-powered organisation whose purpose over the past 20 years has been to vibrate to the effervescence of new aesthetics and imaginary realms that shed light on the ambivalence of our approach to technology. CHRONIQUES embraces a wide range of activities, from programming to funding creation and supporting artists, mediation, educational activities and networking.
Its key international event is the Biennial of Digital Imaginaries that hosts a multidisciplinary program. CHRONIQUES operates on a simple principle: to be what we imagine.

Ars Electronica

Between Art, Technology and Society. We have been analyzing and commenting on the Digital Revolution since 1979. Since then, we have been developing projects, strategies and competencies for the Digital Transformation. Together with artists, scientists, technologists, designers, developers, entrepreneurs and activists from all over the world, we address the central questions of our future. The focus is on new technologies and how they change the way we live and work together. In addition to the annual Ars Electronica Festival and Prix Ars Electronica competition, we host the Ars Electronica Center, a museum of the future, the in-house research and development department Ars Electronica Futurelab as well as the business unit Ars Electronica Solutions.

iMAL

iMAL is an art center for digital cultures and technology, located in the center of Brussels. It combines the functions of a Contemporary Art Center and a Media Lab and is unique in its kind in Belgium. iMAL wants to formulate a solid response to a rapidly evolving digital society. The center will therefore not only provide space for (inter)national art practices that use, challenge and question innovative processes but will also be a place where technological developments and creativity are reflected and shared with a broader community. iMAL strives to create a program that contextualises these developments and inspires and encourages citizens to actively participate in the latest digital cultures, as well as empower them to be critical of the challenges associated with the digital revolution.

V2_ Lab for the Unstable Media

V2_, Lab for the Unstable Media is an interdisciplinary center for art and media technology in Rotterdam (the Netherlands). V2_ presents, produces, archives and publishes research at the interface of art, technology and society. Founded in 1981, V2_ offers a platform for artists, designers, scientists, researchers, theorists, and developers of software and hardware from various disciplines to discuss their work and share their findings. In V2_'s view, art and design play an essential role in the social embedding of technological developments. V2_ creates a context in which issues regarding the social impact of technology are explored through critical dialogue, artistic reflection and practice-oriented research.

KONTEJNER
bureau of contemporary art praxis

KONTEJNER is a non-profit NGO based in Zagreb, Croatia, founded in 2002. It is engaged in curatorial work, organisation of art festivals and public cultural events, artwork production, education, publishing, and social theory. Its primary focus is on progressive contemporary intermedia art, sound art, and experimental music, with a special emphasis on cross-sectorial projects that explore the role and meaning of science, technology, and the body in society, as well as addressing current and relevant phenomena, provocative and intriguing topics, and societal taboos. The KONTEJNER team has curated and organised over 120 group and solo exhibitions, performances, lectures, workshops, and presentations featuring international and Croatian artists, theorists, philosophers, scientists, hackers, and innovators.

L.E.V. Festival

LEV (Laboratorio de Electrónica Visual) is a platform of production, promotion and experimentation related to electronic sound creations, audiovisual creations and digital art.
An open area of research which uses the latest technological tools to explore contemporary creation with national and international avant-garde artists and new and trailblazing creators, performing several activities and shows in public spaces.
The platform's two big annual events are LEV Festival, in Gijón, and LEV Matadero, in Madrid. Two largely attended festivals which serve as a meeting point to provide an all-round, eclectic view of the current state of sound, audiovisual and digital creations, and its constant evolution and connections with different disciplines, through live shows and audiovisual performances, concerts, immersive events of virtual and augmented reality, digital explorations, installations and exhibitions, among other activities.

Dark Euphoria

Dark Euphoria is an artistic production and cultural innovation agency based in Marseille. We produce projects at the crossroads between art and digital technologies: interactive installations, immersive experiences, augmented shows....

We explore new artistic languages and technological devices, shared between artists, creative technologists and cultural institutions. As a pioneer in the production of XR and live performance, Dark Euphoria is particularly committed to reinvent theatrical, musical and choreographic forms and the place of the audience.

CONTEXT

Extended Reality (XR) is an umbrella term encompassing Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). XR spans across the "virtuality continuum," where AR overlays digital elements on the physical world, MR integrates physical and digital objects in real-time, and VR creates fully immersive, digital-only environments.

XR is rapidly adopted in healthcare, education, and entertainment industries due to its ability to create highly interactive, immersive experiences. The potential applications range from medical training and rehabilitation to virtual product visualisation in retail. As hardware and software continue to improve, the XR landscape is evolving with new tools like generative AI for real-time content creation and advancements in haptics and spatial audio for heightened sensory immersion. XR technologies are also profoundly revolutionising the arts and creative industries. The merging of the physical and digital worlds through XR technologies opens up new opportunities for artists to create and for institutions to present art and engage their audiences.

However, challenges remain, including high costs, technical complexities, and concerns about data privacy and user health, such as motion sickness or eye strain. Inevitably, XR's opportunities also introduce critical issues relating to sustainability, ethics, data privacy, and unequal access to technology, to name a few examples.

With input from experts and the participants of the Critical XR Manifesto workshops, the Realities in Transitions white paper aims to explore the current state of XR, outline the key challenges and opportunities, and provide insights into their future trajectory.

THE CRITICAL XR MANIFESTO APP

The Critical XR Manifesto (C.XR.M) is an application created by Realities in Transition that archives statements and creates a Manifesto. It's a movement exploring alternative, inclusive and sustainable XR production. C.XR.M is a tool that is used within a workshop context in order to collect statements on XR, order them in your own favourite way and create an 'common manifesto', making a list of the ten most liked statements.

Through working with this tool, we experiment and support new narratives and creative processes while aggregating the community of European professionals to address cultural and social challenges raised by XR.

THE CRITICAL XR EXPERT WORKSHOPS

Workshops methodology
The sessions showcase the custom-built CXRM (Critical XR Manifesto) app, enabling participants to contribute perspectives and statements to the Realities in Transition Critical XR Manifesto. During the workshops, XR topics are explored in focus groups. Thematics can be chosen according to preference and relevance to cater to the event.

A list of possible topics entail:

- *Overarching topics*
  - XR ethics
  - Sustainable XR
  - XR and surveillance / privacy
  - XR out of the box / experimental approaches

- *Audiences (accessible experiences)*
  - New ways to experience XR IRL / new displays
  - XR in public spaces
  - Collective XR experience
  - Accessibility to impaired and non-human audiences
  - Inclusive XR for underprivileged / low tech communities

- *Makers (technology / methodology)*
  - Mapping Creative and Activist XR practices and communities
  - Educating and developing European XR talent
  - New narratives / storytelling
  - Creative tools & processes in XR production
  - Open source

Track Record

- RIT CXRM workshop at Ars Electronica Festival in Linz (September 2023)[2]
- RIT CXRM workshop in Zagreb during the first RiT XR Camp (Oct 2023)[3]
- RIT CXRM workshop at Immersive Tech Week Rotterdam (December 2023)[4]
- RIT CXRM workshop at Media Lab Matadero in Madrid (December 2023)[5]
- RIT CXRM workshop at New Images Forum in Paris (April 2024)[6]

THE CRITICAL XR EXPERT PRESENTATIONS

Organised by V2_ Lab for the Unstable Media in the frame of Realities in Transition, **Shifting Cosmologies: More Than Human XR**[7] is a series of presentations and interviews that instigates a discursive conversation about XR technologies and their place in our default anthropocentric world.

We consider how XR technology may be used as a theoretical framework and navigational toolkit to reimagine our shifting cosmologies from an anthropocentric reality to one encompassing ecocentrism realities beyond the human experience.

We see this as a first step in generating sustained conversations about non-human-centric XR and the intersection with the areas of philosophy, critical theory, and creative practice in collaboration with the humanities, sciences, and technology in the future.

- **XR Lunch (10 March 2023)**
  Klaas Kuitenbrouwer
- **XR Lunch (28 April 2023)**
  Mia Yu
  Clarissa Ribeiro
  Jo Wei
- **XR Lunch (4 May 2023)**
  Joost Rekveld
- **XR Lunch (7 December 2023)**
  Dr. Iannis Bardakos
- **XR Matinee (26 June 2024)**
  Natasha Greenhalgh
  Chris Salter
  Mihael Giba
  Alexandra Gérard
- **XR Matinee (20 September 2024)**
  Ágnes Karolina Bakk
  Maria Engberg
  Joris Weijdom

Coordinated by CHRONIQUES in the frame of project, the online **Expert talks**[8] provide valuable insights on the practices and challenges faced by XR professionals, being artists, producers, distributors and creative technologists. Through this series of conversations, we engaged in meaningful conversations and collected elements for this White Paper.

Exploring Metaverse: our insights on its definition, history, and original cases
Jesus Jara Lopez, Researcher in Technology and Music, Professor, Expert in XR and part of the LEV Festival team

Mediation in XR: the Importance of Empathy
Michele Ziegler, Chief Digital Officer and Director of the NewImages festival

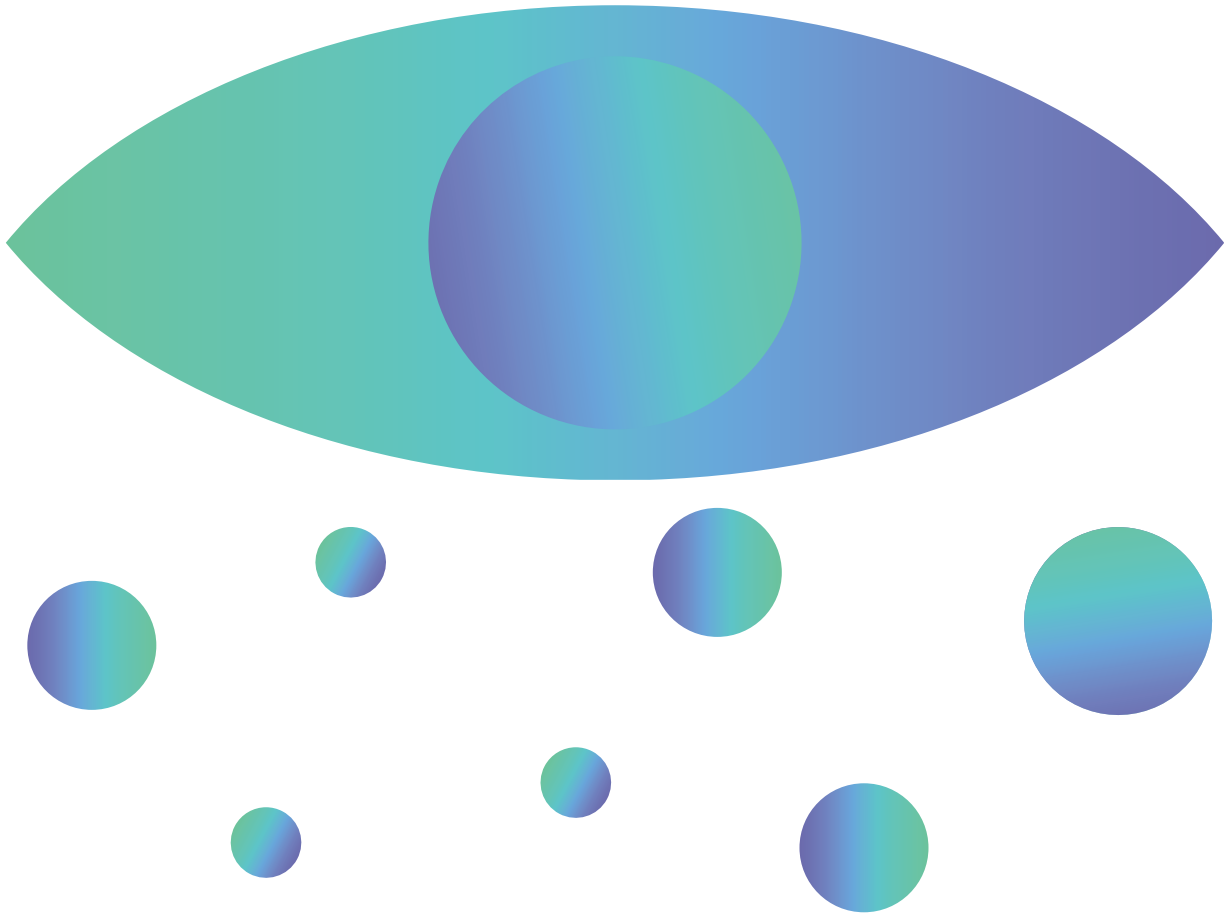
Integrating VR Art into Education: Tina Sauerländer's approach
Tina Sauerländer, co-founder and CEO of Radiance VR

Presentation of Jordan Moutamani (ASTREA)

Presentation of ArsGames

Deep Dive Discussions: Immersive Theatre – in partnership with XR4Europe
Artistic Director Ilaria Nina Zedda
Performance Artist Margherita Landi

The findings of the analysis of the data collected through these different channels are compiled and presented in the sections below, and represent the Realities in Transition White Paper on XR.



CURRENT STATE OF XR GENERAL TOPICS

TECHNOLOGIES OFTEN TEND TO DEVELOP FASTER THAN THE RHETORIC EVALUATING THEM, AND WE CONSTANTLY HAVE TO DEVELOP VOCABULARY FOR ART USING DIGITAL TECHNOLOGIES AS A MEDIUM—IN SOCIAL, ECONOMIC, AND AESTHETIC RESPECTS [1]

Terms like «interactivity» and «immersion» are starting to lose their analytical weight as the digitally mediated world we live in is rapidly changing with XR experiences that combine the real and the virtual. These kinds of experiences tend to be grouped together under the broad term «XR» instead of considering what makes these experiences unique on their own. In other words, the qualities that are usually linked to digital media need to be explained more thoroughly because they are used in such a broad way that they don't really mean anything. (Paul 2015, p. 67). At this point, the concept of virtual reality (VR) may have led to more study in this area. Although fundamental commonalities are obvious, we should not confuse immersive experiences with XR experiences or interaction with digital media.

TO ENSURE THE POTENTIAL FUTURE OF XR FOR SOCIAL ENGAGEMENT AND COLLABORATION, WE SHOULD NOT LINGER IN IMMERSIVE ESCAPISM BUT INSTEAD DESIGN GROUNDED EXPERIENCES THAT AUGMENT OUR BOND WITH THE ACTUAL WORLD AROUND US.

INFRASTRUCTURAL AWARENESS: DON'T FORGET OUR 'REAL' WORLD!

To ensure the potential future of XR as a tool for meaningful social engagement and collaboration, we must be cautious about its use solely for immersive escapism. When XR experiences are designed with a focus on escapism, there is a risk of alienating users from the tangible world and the real communities surrounding them. Instead, XR should be developed as a bridge, enhancing our connection to real-world environments, relationships, and collective goals. We can learn from creators who use this technology beyond the obvious applications by adopting a human-centred perspective. Creating grounded XR experiences means designing applications that overlay digital information and interactivity onto our existing surroundings, facilitating a deeper understanding of and engagement with the physical world. Such applications can transform public spaces into interactive, shared experiences that build connections and foster collaboration, not just within the digital realm but in the actual, everyday environments we inhabit. By doing so, XR technology can become a tool for uniting people, reinforcing shared values, and encouraging real-world action rather than serving as an escape from reality. Ultimately, this approach helps ensure that XR will be a sustainable, valuable medium that brings us closer to each other and the world we share.

CAPTURED DATA BY XR DEVICES MAY NOT BE STORED WITHOUT THE DISTINCT PERMISSION OF THE USERS.

WE NEED TO KNOW THE BUSINESS MODELS BEHIND XR APPLICATIONS AND ADVOCATE FOR A HUMAN-FIRST APPROACH.

New forms of spatial virtualisation are closely associated with ubiquitous computing and are based on capturing, analysing and computing user data. This data may include highly sensitive information and range from environmental details, user interactions, and physical movement patterns to facial expressions, eye tracking, and even biometric data. The intimate nature of this information introduces privacy concerns and regulatory and ethical challenges. To counter mass control and surveillance, data gathered by such technologies must not be stored, processed or accessible by third parties without explicit user consent. User consent ensures that individuals understand exactly what data is being collected, how it will be used, and who will have access to it. Storing XR data without permission could lead to user privacy violations, increased vulnerability to data breaches, and potential misuse by third parties. By requiring distinct permission, users retain control over their personal information, allowing them to make informed choices about their data's storage and use. This is especially crucial in XR envaironments, where data can reveal not just explicit actions but also subtle behavioural cues that could be exploited if mishandled.

In conclusion, "XR stakeholders should actively develop and/or support efforts to standardise differential privacy and/or other privacy protocols that provide for the protection of individual identities and data." [2]

TECHNOLOGICAL CHANGE IS AT THE CORE OF MAJOR DISRUPTIONS IN HUMAN HISTORY. NOT ALL DEVELOPMENT IS BENEFICIAL. TECHNOLOGY HAS FUELED GREAT INNOVATIONS, AND THE NOTION OF SUSTAINABLE DEVELOPMENT HAS GAINED PROMINENCE AS WE NOW EXPERIENCE SOCIAL, ECONOMIC, AND ENVIRONMENTAL CHALLENGES. [3]

VIRTUAL WORLDS ARE REAL, TOO, AND VERY PHYSICAL. THEY LIVE IN ACTUAL COMPUTERS RUNNING ACTUAL ENERGY AND SOMETIMES CONSUMING LARGE QUANTITIES OF NATURAL RESOURCES, LIKE WATER.

Although intangible, virtual worlds rely heavily on physical resources and infrastructure. These digital spaces inhabit real computers—large, energy-intensive servers housed in data centres worldwide.

When millions of users log into a virtual world, whether for gaming, social interaction, or work, these platforms utilise vast quantities of electricity to power the servers, keep them cool, and ensure stable network connectivity. Cooling these servers, which generate intense heat, often requires substantial water usage in air conditioning systems or other cooling mechanisms.

Moreover, the energy consumption of virtual worlds can be significant. Each interaction in these worlds, from a simple message to complex 3D rendering, requires processing power. This processing power translates into electricity demand, which in turn contributes to the strain on natural resources, particularly in areas where fossil fuels are used to generate energy.

Some large-scale digital environments, like those in the metaverse or massively multiplayer online games, require high levels of data storage and processing capabilities. To meet these needs, major tech companies have invested in building vast data centres, often located near rivers or other water sources, to help with cooling, emphasising the link between the physical and digital realms. As a result, these virtual worlds aren't just simulated environments—they have a very real ecological and material footprint.

YOU SHOULD NOT NEED NEW XR HARDWARE TO RUN OLD XR SOFTWARE. BACKWARD COMPATIBILITY, ALTHOUGH LESS PROFITABLE, IS ALWAYS MORE SUSTAINABLE.

Backward compatibility in XR hardware means ensuring that newer devices can run software built for older models and maintaining access to past applications, experiences, and tools. This approach is not only practical but also aligns with sustainable technology principles. For one, it extends the lifecycle of both hardware and software, reducing electronic waste and conserving resources by minimising the need for consumers to upgrade constantly.

From a user experience perspective, backward compatibility means people who invest in XR hardware are not forced into planned obsolescence; they can continue to enjoy and utilise their favourite applications, creating a sense of security and trust with the brand. This stability can actually strengthen user loyalty in the long run, even if it means slightly reduced profits from frequent hardware upgrades. Additionally, developers benefit from backward compatibility as it lowers the pressure to constantly update their applications for compatibility with new hardware, allowing them to focus on content quality and innovation.

Regarding sustainability, backward compatibility reduces the demand for new device manufacturing. Producing XR hardware is resource-intensive, requiring materials like rare metals, energy, and extensive logistics. By supporting older software on new devices, companies can reduce the frequency of device replacements, contributing to the broader goals of environmental conservation and sustainable tech development.

AS INDIVIDUALS MORE DEEPLY EMBRACE THESE TECHNOLOGIES TO AUGMENT, IMPROVE AND STREAMLINE THEIR LIVES, THEY ARE CONTINUOUSLY INVITED TO OUTSOURCE MORE DECISION-MAKING AND PERSONAL AUTONOMY TO DIGITAL TOOLS. [4]

TO A LOT OF PEOPLE, HUMAN AGENCY IS STILL THE ONLY REAL SOURCE OF AGENCY IN EXISTENCE, ALTHOUGH MANY BEGIN TO GET USED TO THE IDEA OF MACHINIC AGENCY. [5]

According to the Critical Engineering Manifesto, a critical engineer should recognise that each work of engineering engineers its user, proportional to that user's dependency upon it. As such, "The Critical Engineer considers any technology depended upon to be both a challenge and a threat. The greater the dependence on a technology, the greater the need to study and expose its inner workings, regardless of ownership or legal provision." [6]

Digital tools are designed to simplify complex tasks, often by analysing vast amounts of data and applying sophisticated algorithms to produce optimised suggestions or actions. For instance, a GPS app doesn't just provide a map; it suggests the fastest route, potentially modifying the user's behaviour in ways they might not otherwise choose. Similarly, algorithms on social media or content platforms recommend posts, products, or news that

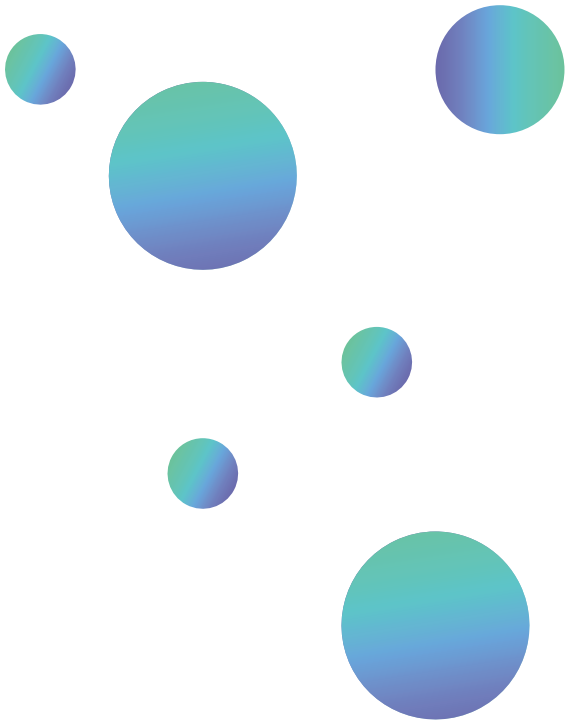
are likely to engage the user, influencing not only what they see but also what they think and feel.

With each interaction, users are invited to hand over more control, often without fully recognising the trade-offs involved. This can lead to a diminished sense of personal agency and critical thinking as users become accustomed to simply following a machine's "best" path. Over time, the dependence on technology for even minor decisions may reduce the user's decision-making skills and erode their sense of independence.

XR WILL TRANSFORM OUR PERCEPTION OF THE WORLD. HOWEVER, WE MUST REMAIN VIGILANT AGAINST XR BECOMING A TOOL FOR CORPORATIONS TO AMPLIFY THE ECHO CHAMBERS ALREADY PRESENT. RESPONSIBLE IMPLEMENTATION IS CRUCIAL TO PREVENT FURTHER ISOLATION AND FRAGMENTING OF OUR COLLECTIVE VISION.

As XR adoption grows, corporations may exploit it to deepen existing echo chambers and perpetuate biased content, intensifying confirmation bias by tailoring immersive experiences to align with individual preferences. By reinforcing pre-existing beliefs and narrowing the diversity of perspectives, XR could inadvertently contribute to a fragmented society where people become increasingly isolated within their custom-built digital environments. This isolation risks eroding the shared, collective vision essential for addressing complex, global issues.

To counteract this, the responsible implementation of XR technologies is essential. This includes establishing ethical design standards, transparency of content algorithms, and ensuring diverse perspectives within XR environments. Developers and stakeholders should focus on creating XR experiences that encourage exploration beyond individual viewpoints and foster a sense of community and understanding across divides. Education and regulatory frameworks must also evolve alongside XR to provide users with the skills and critical thinking necessary to navigate immersive spaces without falling prey to manipulation.



OPPORTUNITIES & CHALLENGES FOR XR CREATIVES

HIGH TECHNOLOGY MEANS SOMETHING OTHER THAN HIGH CREATIVITY. IN FACT, SOMETIMES, THE RESTRICTIONS OF A MEDIUM LEAD TO THE MOST CREATIVE SOLUTIONS. [7]

High technology often implies advanced tools, automation, and capabilities that streamline processes, enhance precision and open new creative avenues. However, relying on high technology doesn't necessarily equate to achieving high creativity. In fact, advanced tools and technologies can sometimes make us complacent, giving us ready-made solutions or shortcuts that prevent us from pushing boundaries or thinking innovatively.

Historically, some of the most creative breakthroughs have emerged from the constraints and limitations of specific mediums. For example, early filmmakers faced severe restrictions in special effects, colour, and sound, yet these limitations spurred imaginative solutions. Directors used lighting, camera angles, and practical effects in ways that are still celebrated today. Constraints, like limited resources, time, or tools, often foster a unique type of innovation because they force creators to think differently. Rather than relying on abundant resources, they must carefully assess what they have and explore unconventional ways of using them. This can lead to unexpected and fresh results, often pushing the boundaries of the medium and introducing new perspectives.

BREAK THE RULES - DO NOT LET TECHNOLOGY DICTATE YOUR ART.

High technology, in contrast with more traditional art forms, can make creation seem limitless but, paradoxically, can lead to more conventional or formulaic outcomes because it removes the "friction" that often sparks creative problem-solving. While it offers exciting new tools and possibilities, true creativity emerges when creators can harness limitations as opportunities, challenging them to approach their work with fresh perspectives and innovative solutions.

ARTISTS SHOULD EMPLOY XR TOOLS TO DEFY THEIR MANUFACTURERS' INTENTIONS AND CONCENTRATE ON EXPRESSION RATHER THAN THE TOOL'S CAPABILITIES. [8]

ARTISTS HAVE THE RESPONSIBILITY TO CREATE TOOLS OF EXPRESSION AND NOT OF ESCAPISM OR CONSUMERISM.

ARTWORKS THAT USE NEW, EXPENSIVE TECHNOLOGY CAN'T AVOID BEING, IN PART, A SALES PITCH.

Artists working with XR technologies should view these technologies not as rigid platforms defined by the manufacturer's vision but as raw materials for their own creative expression. Many XR tools have built-in design assumptions, often aiming to enhance immersion, gamify experiences, or create a sense of "realness" within a digital space. However, this prescribed functionality can feel limiting for artists, framing the tool's potential within narrow, utilitarian boundaries.

By challenging these boundaries, artists can redefine what XR tools are capable of, using them to express unique perspectives or convey emotional depth rather than simply achieving awe through technical effects. This might mean intentionally distorting environments to evoke discomfort or using VR in minimalist ways to focus on subtle storytelling rather than overwhelming visuals. In other words, the power of XR in the hands of an artist comes from breaking free of the standard UX-driven paradigms and transforming these tools into means for experimentation, exploration, and nuanced expression. In doing so, artists can create works that don't just utilise XR but question it, pushing audiences to think about the role of technology in our lives and expanding the aesthetic and emotional range of digital experiences. Rather than a finished "reality," XR becomes a flexible, even rebellious space where both artist and audience redefine what's possible beyond the expectations of the tools' creators.

OPEN-SOURCE EXCHANGE OF KNOWLEDGE AND RESOURCES IN XR CONTRIBUTES TO THE GROWTH AND DEVELOPMENT OF A COLLABORATIVE AND SUPPORTIVE GLOBAL COMMUNITY.

INTERDISCIPLINARY COLLABORATION AND COMMUNICATION ARE ESSENTIAL IN XR PRODUCTIONS BECAUSE THE MEDIUM REMEDIATES MULTIPLE EXISTING MEDIA.

DON'T TRY TO MASTER ALL TOOLS; JOIN COMMUNITIES!

The lack of digital and physical technological resources limits the people involved and, thus, the communities they thrive in. The open-source exchange of knowledge and resources in extended reality (XR) is a powerful driver for growth and development within a global community that thrives on collaboration and mutual support. By making tools, frameworks, and best practices freely available, developers, designers, and creators in XR can learn from one another, iterate faster, and build on each other's work. This open-access approach lowers the entry barriers for individuals and organisations, enabling more diverse voices to contribute to the XR landscape.

In addition, open-source contributions often include software libraries, hardware designs, research findings, and creative assets, all of which enable innovation across XR domains like virtual reality (VR), augmented reality (AR), and mixed reality (MR). For instance, through repositories like GitHub or libraries of open-source assets, XR creators can share immersive tools, environments, and interaction methods that others can then adapt, refine, or expand.

Community exchange cultivates a learning environment where novices and experts can come together, helping to democratise access to cutting-edge technology. Furthermore, it encourages a sense of community ownership over XR development, inspiring creators worldwide to engage, contribute, and grow together.

Interdisciplinary collaboration and communication are essential in XR (Extended Reality) productions because this medium inherently remediates multiple forms of media, blending elements from film, theatre, interactive design, and even gaming. In XR, professionals from diverse fields—such as developers, designers, filmmakers, sound engineers, UX experts, and artists—work together to create immersive experiences that integrate visual, auditory, tactile, and even olfactory elements. This convergence requires specialists to share knowledge across disciplines to ensure cohesive storytelling and technical functionality.

For instance, a cinematographer's understanding of framing and lighting must merge with a 3D modeller's grasp of virtual space. At the same time, a game developer's skills

in interactivity must harmonise with a storyteller's sense of pacing and character development. Furthermore, the dynamic, immersive nature of XR demands constant, real-time collaboration between creative and technical teams to adapt to the spatial and sensory demands unique to each experience. This fluidity highlights the importance of clear, ongoing communication to address challenges like spatial sound design, latency issues, user interaction, and audience engagement, all while navigating the evolving boundaries of XR technology.

IN THE CREATION PROCESS, ALREADY CONSIDER HOW YOU CAN SHARE YOUR XR WORK!

THINK ABOUT THE ARCHIVE: THE DOCUMENTATION AND THE PRESERVATION OF YOUR XR WORK.

When creating an XR experience, thinking about sharing and distribution from the beginning is important. To reach a broader audience, optimise for different device types and consider accessibility features to make the experience inclusive. Platform compatibility ensures your XR experience is compatible with multiple platforms. Consider how moments from the XR experience can translate to popular social media platforms. Creating a sharing-friendly experience often involves considering long-term engagement. Plan for how users might interact with updates, new features, or special events within the XR experience. This approach not only retains users but also encourages them to share the evolving experience with others.

Documenting and preserving your XR production for future access and reference is critical, especially as technology and platforms evolve. Capture comprehensive documentation throughout the development process. This includes project goals, design choices, user interface elements, and any technical workflows or unique methodologies used. Detailed notes, version histories, and diagrams can be invaluable for future creators or maintainers who want to understand the original vision and technical structure.

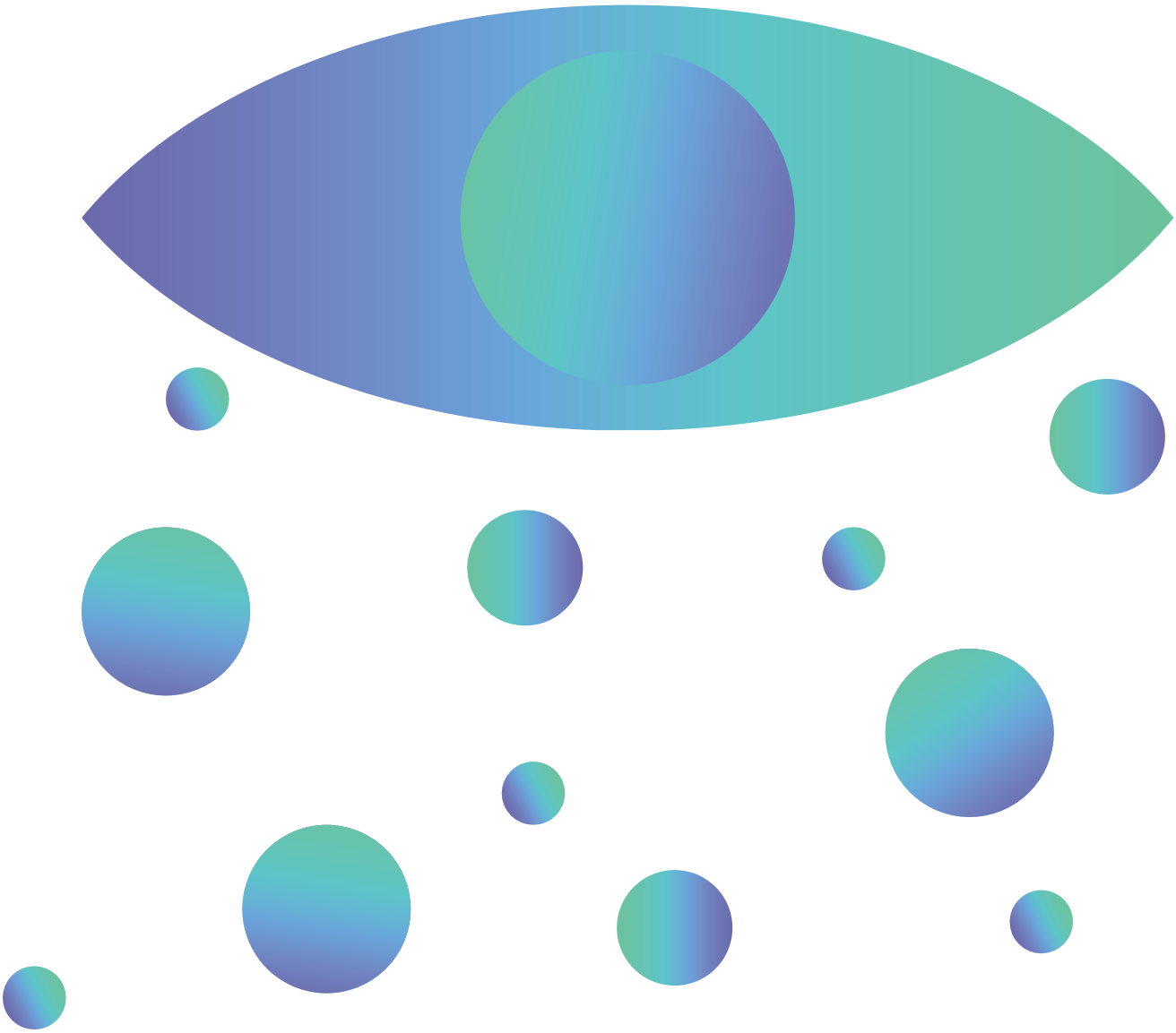
Since XR experiences are inherently interactive and immersive, recording high-quality video walkthroughs, 360-degree snapshots, and user interaction samples can help capture the essence of the experience. This media can be essential for people in the future to understand how users should interact with the environment and its narrative.

XR experiences are defined by their interactivity, so preserving this aspect is crucial. Look into tools that capture interactive workflows, or consider creating a standalone version replicating key interactive elements. Emulators or virtual environments might also allow future users to experience the original level of interactivity.

Consider licensing and access rights when preparing your XR work for the archive. Define who can access and use the materials, whether for personal, educational, or commercial use. Open licenses can be especially beneficial for archival purposes, allowing future creators to explore, adapt, and build upon your work.

Keep in mind that an XR experience archived today may need adjustments or updates in the future. For example, keep records of software or libraries used that might eventually need replacement and consider creating a plan for periodic file format migrations to newer, more accessible formats as they emerge.

Collaborating with organisations specialising in digital preservation, such as libraries, museums, or digital archives, can enhance the accessibility and longevity of your XR experience. Many of these institutions have specific expertise in archiving digital media. They can provide guidance on best practices, support for storing large files, and frameworks for sharing your work with a broader audience.



OPPORTUNITIES & CHALLENGES FOR XR DISTRIBUTION

XR ART MUST BE OPEN TO AS MANY PEOPLE AS POSSIBLE AND NOT TAKE REFUGE IN INTELLECTUAL INACCESSIBILITY RESERVED FOR THE ART ELITE; IT MUST BE VISIBLE IN THE STREET! [9]

EVERYTHING SHOULD BE DISTRIBUTED IN A WAY THAT ENCOURAGES COLLECTIVISATION AND COMMUNITY GROWTH.

XR enables museums, galleries, and cultural centres to create innovative exhibition formats by replicating and enhancing physical spaces. These virtual environments or exhibitions can include multimedia elements—such as audio guides, artist interviews, and additional context—providing a richer experience than traditional exhibitions.

Alternatively, XR experiences can transcend the walls of cultural centres, allowing audiences worldwide to engage with art that they might not have access to in physical spaces. Through their smartphones or AR glasses, users can view artworks from home. This democratises cultural access, enhances personal engagement, and encourages social sharing. The expanded audience reach engages younger generations, especially those drawn to digital experiences. XR can capture their attention through gamified elements and interactive storytelling, making art more appealing and relevant to a tech-savvy audience.

Beyond efforts by organisations, artists can host live VR events or AR installations on their own, where audiences participate in real-time discussions or co-create art, strengthening community ties. Those XR platforms facilitate DIY community interaction through shared experiences.
In all three cases, implementing XR technologies opens up new revenue opportunities for the art sector through virtual ticket sales for exhibitions, digital art sales, and subscription models for exclusive content or experiences.

IT'S LIKE A DIGITAL LAYER ON TOP OF THE REAL WORLD, MAKING EACH VISIT TOTALLY PERSONALISED!

In terms of audience engagement, personalised XR experiences can create deeper emotional connections by tailoring the content to a user's specific preferences or behaviours. The more an experience aligns with a person's expectations or desires, the more likely they are to stay engaged.

To boost a deeper involvement and the likelihood of repeated use, personalised XR experiences use features such as avatars that resemble the user, curated storylines, customised challenges and interactive aspects to tailor their virtual world. By adapting the narrative based on real-time responses or the participant's known preferences, the experiences become more relatable and memorable, as the content feels uniquely relevant to each user.

One of the most significant issues about customised XR experiences is the amount of personal data acquired to build tailored interactions. The audience may be concerned about the quantity of personal information necessary to personalise the experience, particularly if data use is unclear. If the audience believes their privacy is being violated, this may cause mistrust and, in certain situations, decreased engagement. Additionally, over-personalisation might trap users in a feedback loop of their own preferences, limiting exposure to new ideas or broader experiences. Like recommendation algorithms of streaming platforms, users are presented with content similar to those they've previously liked and may miss out on discovering new forms or genres. Finally, personalised content comes at the expense of shared collective experiences. If every person has a unique experience, it can reduce opportunities for communal discussion or group engagement, limiting social cohesion around the content. In traditional media, there is a communal aspect to experiencing the same content.

Personalised XR experiences can transform audience engagement through immersive, interactive, and emotionally compelling content. However, the success of these experiences hinges on balancing personalisation with privacy, maintaining accessibility, and avoiding excessive fragmentation of user journeys. To maximise the potential of personalised XR for meaningful, inclusive, and enriching audience engagement, both creators and distributors need to address these issues critically. During highly individualised experiences, shared virtual areas to share experiences with other users could encourage participation while maintaining a feeling of community.

XR TECHNOLOGIES SHOULD ALLOW NON-LINEAR INCLUSIVE STORYTELLING OF MULTIPLE REALITIES AND HISTORIES, ENABLING AND GIVING ACCESS TO MARGINALISED COMMUNITIES.

XR technologies can create engaging environments that go beyond traditional media formats by allowing for interactivity, immersion, and personalisation. They have the potential to transform storytelling by embracing non-linear narratives and multiple realities, thereby giving voice to marginalised communities and ensuring more inclusive representation. However, marginalised communities often face barriers in accessing and creating media that reflects their experiences. Therefore, carefully considering access, participation, and cultural nuances is crucial for fully realising this potential. XR has the potential to democratise storytelling by empowering creators from these communities to tell their personal stories through interactive and immersive formats. Through open distribution platforms, those stories can engage broader audiences to participate and understand the lived experiences in a more empathetic way. XR's potential to create and convey experiences makes it an ideal platform to explore counter-narratives, challenging dominant narratives and providing alternative viewpoints to mainstream history. XR could illustrate how different aspects of identity (race, gender, class, etc.) interact by allowing users to explore scenarios that reflect complex intersections, often left out of simplified linear narratives.

AS XR ADVANCES, THERE IS A RISK OF CREATING A DIGITAL DIVIDE WHERE ACCESS TO THESE TECHNOLOGIES BECOMES A PRIVILEGE RATHER THAN A UNIVERSAL RIGHT.

XR technologies are often expensive. High-end VR headsets and the necessary computing power or devices to run them can be cost-prohibitive for many. In addition, regular upgrades to keep up with advancing technology could further widen the gap between those who can afford to stay up-to-date and those who cannot. This creates a situation where wealthier individuals and communities have access to enhanced learning, job opportunities, and experiences while those with fewer resources are left behind.

I KEEP HEARING ABOUT XR BEING THE FUTURE. WHAT ABOUT THE IMPAIRED, THOSE WITHOUT DEPTH PERCEPTION, VERTIGO OR OTHER, THOUGH? SHOULDN'T WE ADDRESS THIS FIRST BEFORE SPECULATING ABOUT THE FUTURE?

People with physical or cognitive disabilities could face challenges accessing XR technologies if these systems are not designed with inclusivity in mind. While XR has the potential to assist people with physical or cognitive impairments, the devices and interfaces must be accessible for all users, which requires thoughtful design and ongoing consideration of diverse needs.

TO TACKLE DIGITAL ILLITERACY, EFFORTS MUST BE MADE TO EDUCATE INDIVIDUALS AND COMMUNITIES ON THE POTENTIAL RISKS AND BENEFITS OF XR, CULTIVATING A DIGITALLY LITERATE SOCIETY THAT CAN CRITICALLY ENGAGE WITH THESE TECHNOLOGIES. [10]

The rise of XR technologies in education can offer students immersive, engaging learning experiences that may enhance understanding and retention of information. However, if access to XR tools is restricted to certain schools or regions due to economic or geographic limitations, students in disadvantaged areas may fall further behind. This divide exacerbates the inequality in education, where students without access to XR miss out on the benefits of interactive and hands-on learning.

Skills and knowledge barriers might introduce a gap in technical literacy. Those with the knowledge and skills to design, use, and troubleshoot XR technologies will have a significant advantage in the future job market. If educational and training opportunities related to XR are unevenly distributed, individuals from privileged backgrounds or with access to tech-forward educational institutions may develop these crucial skills, leaving others at a disadvantage.

OVER THE COURSE OF THE STUDY, IT BECAME OVERWHELMINGLY APPARENT THAT THE OCULUS GO (AND, I WOULD IMAGINE, ANY OTHER HIGH-DEFINITION VR HEADSET, FOR THAT MATTER) WAS NOT DESIGNED WITH BLACK WOMEN IN MIND. THE TEXTURE, SIZE, & STYLING OF BLACK HAIR WERE UNSUITABLE FOR THE DEVICE. [11]

Cultural and linguistic biases in hardware and content development might seep in as XR technologies evolve. If the majority of XR content is created by developers from specific cultural or linguistic backgrounds, it may not be inclusive of diverse populations. This can alienate users from different cultural or linguistic contexts who may not see themselves or their experiences reflected in XR spaces.

To mitigate the risks of a digital divide and prevent XR from becoming a technology accessible only to a privileged few, certain actions should be considered. By addressing these issues proactively, XR technologies can be positioned as tools for inclusion and empowerment rather than reinforcing existing inequities in access to technology. Affordability Initiatives such as developing lower-cost XR devices or subsidy programs could make these technologies more widely accessible. Additionally, educational programs that teach XR skills—from programming to creative development—could help bridge the gap and ensure that more people are prepared for an XR-integrated world. XR products should be designed with accessibility in mind from the outset. Therefore, developers and companies should prioritise the creation of diverse, inclusive hardware and content that represents a wide range of cultures, languages, and experiences.

CONCLUSION

To conclude this exploration of XR technologies, it is evident that their potential to transform how we interact, create, and engage with the world around us is profound. However, the realisation of this potential comes with critical challenges and responsibilities.

First, XR must move beyond immersive escapism and instead focus on fostering meaningful connections to the physical world and its communities. Ethical concerns around privacy, data collection, and the ecological footprint of virtual environments highlight the need for responsible design and implementation. Developers and stakeholders must prioritise human-centred approaches safeguarding individual agency while promoting collaborative and inclusive experiences.

Accessibility and inclusivity remain paramount as XR evolves. Overcoming barriers related to cost, cultural representation, and physical usability ensures these technologies do not exacerbate existing inequalities. Designing with diverse users in mind and emphasising open-source collaboration can help democratise XR, making it a tool for empowerment and shared creativity.

Creatively, XR offers a unique platform for innovation, particularly when used to challenge norms and amplify marginalised voices. Artists and developers must resist letting technology dictate their vision, instead embracing XR as a flexible medium for non-linear storytelling and critical exploration.

Ultimately, the future of XR lies in balancing innovation with ethical and sustainable practices. By addressing these challenges proactively, XR can fulfil its promise as a transformative force that enriches the human experience while preserving the values of equity, creativity, and collective progress.

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