PREMIERE
Performing arts in a new era

# D7.5 - Ethical considerations in motion-capture based research in performing arts v1

**Date – 05/12/2025**

**Document identifier:** PRMR-D7.5-Ethical considerations in motion-capture based research in performing arts – actualized version of mid-term PRMR-D7.4 v1.
**Version:** 1
**Author:** Erik Lint, Amsterdam University of the Arts (AHK), Sorcha Ní Bhraonáin (AHK)
**Dissemination status:** Public

Funded by
the European Union

| | |
|---|---|
| **Grant Agreement n°** | 101061303 |
| **Project acronym** | PREMiERE |
| **Project title** | Performing arts in a new era: AI and XR tools for better understanding, preservation, enjoyment and accessibility |
| **Funding Scheme** | HORIZON-CL2-2021-HERITAGE-01 (HORIZON Research and Innovation Actions) |
| **Project Duration** | 01/10/2022 – 30/09/2025 (36 months) |
| **Coordinator** | Athina-Erevnitiko Kentro Kainotomias Stis Technologies Tis Pliroforias, Tonepikoinonion Kai Tis Gnosis (ARC) |
| **Associated Beneficiaries** | ▪ Stichting Amsterdamse Hogeschool voor de Kunsten (AHK)<br>▪ Forum Danca - Associacao Cultural (FDA)<br>▪ Tempesta Media SL (TMP)<br>▪ Cyens - Centre of Excellence (CNS)<br>▪ Kallitechniki Etaireia Argo (ARG)<br>▪ Medidata.Net - Sistemas de Informacao para Autarquias SA (MED)<br>▪ Fitei Festival Internacional Teatro Expresao Iberica Crl (FIT)<br>▪ Instituto Stocos (STO)<br>▪ Universite Jean Monnet Saint-Etienne (UJM)<br>▪ Associacao dos Amigos do Coliseu Doporto (COL)<br>▪ Stichting International Choreographic Arts Centre (ICK) |



Funded by the European Union

# Project no. 101061303
# PREMiERE

Performing arts in a new era: AI and XR tools for better understanding, preservation, enjoyment and accessibility

HORIZON-CL2-2021-HERITAGE-01

**Start date of project:** 01/10/2022

**Duration:** 36 months

| History Chart | | | | |
|---|---|---|---|---|
| Issue | Date | Changed page(s) | Cause of change | Implemented by |
| 0.1 | 02/08/2024 | PRMR-D7.4 | Camera Ready | Erik Lint (AHK) = EL |
| 0.2 | 22/09/2025 | PRMR-D7.5 | Actualisation D7.4→D7.5 | EL |
| 0.3 | 01/10/2025 | New Chapter v1 | VR Theatre experimentation | (SnB) Sorcha Ní Bhraonáin (AHK) |
| 0.4 | 01/10/2025 | New Chapter V2 | VR Theatre experimentation | Sorcha Ní Bhraonáin (AHK) |
| 0.5 | 20/10/2025 | Draft | Restructure | SnB, EL (AHK) |
| 0.6 | 22/10/2025 | ALL | Internal Feedback AHK | Sorcha Ní Bhraonáin (AHK) |
| 0.7 | 06/11.2025 | ALL | update content | SnB, EL (AHK) |
| 0.8 | 21/11/2025 | ALL | Feedback TEMP Feedback FDA | SnB, EL (AHK) |
| 0.9a | 02/12/2025 | ALL | Feedback CNS | Erik Lint (AHK) |
| 0.9b | 03/12/2025 | 21, 67, 68 | Last corrections | Sorcha Ní Bhraonáin (AHK) |
| V1 | | | | |

| Validation | | | |
|---|---|---|---|
| No. | Action | Beneficiary | Date |
| 1 | Prepared | Sorcha Ní Bhraonáin (AHK)<br>Erik Lint (AHK) | 18/09/2025 till 23/10/2025 |
| 2 | Feedback | Elena Ananiadou (TEMP) | 10/11/2025 |
| 3 | Prepared | Sorcha Ní Bhraonáin (AHK)<br>Erik Lint (AHK) | 17/11/2025<br>21/11/2025 |
| 4 | Feedback | Ezequiel Santos (FDA) | 21/11/2025 |
| 5 | Feedback | Kleanthis Neokleus (CNS) | 26/11/2025 |
| 6 | Prepared | Sorcha Ní Bhraonáin (AHK)<br>Erik Lint (AHK) | 03/12/2025 |
| 7 | Approved | (FDA) (TEMP) (CNS) | 04/12/2025 |
| 8 | Released | (AHK and all) | 05/12/2025 |



Funded by the European Union

Funded by
the European Union

# Table of Contents





Funded by the European Union

Funded by the European Union

# I List of figures





Funded by the European Union

# II Executive Summary

This 'living' document outlines an ethical framework in the sense of guidance ethics centered around responsibility, awareness, vulnerability, taking care, organology, and knowledge transfer within the context of education, (archiving) the performing arts and intelligent system design. An open and explorative framework has been designed to navigate the complexities of ethical decision-making in dynamic social environments, emphasizing the importance of adaptability, interdependency, and sustainability. It is also about embodied knowledge transfer, cognition, and the technological condition of humans, given the past, present and future. Where humans do not relate to technology in a binary way but find themselves in a complementary co-evolutionary tension. In that sense, this deliverable explores the playing field around the technicity of people and machines, transmediality and ethics of care; between generic plural uniformity and unique singular diversity.

This deliverable is meant to guide the discussions around the ethical implications of the PREMiERE project. Questions arose are:

- What are the ethical considerations of collaborative artistic research projects that employ motion-capture and XR tools?
- What are the implications of detaching the data which a human body produces from the person embodying that data?
- What are the consequences of developing necessarily uniform motion capture systems to capture naturally ephemeral and unique expressions of the human body?
- Does the successful adoption of the tools within the performing arts only occur via the end users or should one consider spectators and the next generation of target users as well?

In the context of the PREMiERE project, AHK and partners position research in this deliverable as a dynamic and evolving ecosystem: one characterised by flows of interaction, emergent patterns and situated responses. Our ethical stance on technologically intensive artistic research processes is philosophically grounded by a theoretical framework which mixes theories of **organology**, **cosmotechnics**, **sym-poiesis** (via Gilbert Simondon, Bernard Stiegler, Yuk Hui, Haraway). Within this frame we foreground two interlinked values: **generosity** (openness, epistemic hospitality) and **response-ability** (readiness to act relationally and contextually). These values guide our approach and governance of cross-domain, co-creative inquiry: artists, technologists and policy actors evolve their practices together, not as token participants but as co-creators of meaning, design and feedback loops.

### Core Values

**Generosity** is considered as an epistemic posture of open receptivity, welcoming difference, diversity, context, history, and the unexpected. Research is fundamentally about relations as prof. dr. Laura Cull states "conversation, dialogue, exchange, reciprocity, listening, movement: an embedded practice of the many. You don't do research 'about' some



Funded by the European Union

‘thing’. Research happens in the middle.” It is open to surprise, enchantment and does not move away from friction.

In our setting this means valuing the perspectives of artists as co-researchers, not merely as participants or case-studies; designing for emergent patterns rather than imposing pre-determined schema; and prioritizing the cultivation of relationships over extractive capture.

**Response-ability** describes the capacity to respond meaningfully according to the context, rather than assuming top-down control. This aligns with a view of research as becoming rather than fixed being. It invites ongoing feedback loops, co-creation, and adaptation in light of each encounter. In our method, the research design is circulated by artists’ feedback, heightened perception, response, reflection, adaptation, imagination and zoning in on evolving patterns rather than validating assumptions of programmers or technologists alone.

**Co-creation**: By linking generosity and response-ability consortium partners arrived at a co-creative research posture: researchers, artists, technologists, policy actors evolve together through processes of multi-directional feedback rather than linear, one-sided transfer. The input of artists and technologists has been an integral part of the development of this research eco-system. Traces of our co-creative mode of research can be found in the separate work packages and deliverables beyond WP7. The various uses cases, workshops and experiments were presented during the final public event of the PREMiERE research project at Coliseu Theatre in Porto, marking an inspiring conclusion to a project where performances revealed how technology — and the synergy between researchers and artists — can transform artistic creation.

### Structuring Components of Research

1. **Interactive Processes**: Research cycles are open to fluctuations, not rigid milestones only. They are designed as iterative flows of interaction between artists ↔ technologists ↔ institutions.
2. **Emergent Sym-poiesis**: Rather than imposing a fixed rubric to research-creation, we cultivate the emergent capacity of the making process. We pay attention to unplanned insights, events and encounters that create new configurations of theory and practice. We trace the patterns of these emergent phenomena and the conditions from which they arise over time.
3. **Situatedness & diversity**: Each domain partner (artist, technologist, institution) brings their own context and history to the table. Diversity is a generative principle that encompasses diverse worldviews and cosmologies of practice . The making of artistic research is informed by the specific conditions of its emergence.
4. **Feedback & Responsiveness**: Built into the design are feedback loops with artists: frequent check-ins, reflexive sessions, adaptation of research questions/designs in light of what the artist perceives as meaningful or not. The aim is not to *use* artists as proof of technological solutions but to **co-create** research questions, frameworks, artefacts.
5. **Governance & Generous Protocols**: We will develop an approach that ensures generosity in data-sharing, authorship recognition, openness to non-normative outcomes. Researchers will distribute epistemic ownership and invite artist-led



Funded by
the European Union

directions.

### Applications in Placemaking and Mapping

1. **Intentional Encounter Between Domains in PREMiERE - Interdependency Awareness**
    - Promotes collaboration across different domains to foster interdependency awareness.
    - Encourages intentional encounters that lead to a deeper understanding of mutual dependencies, potentialities and ethical considerations.
2. **System-Based (Re-)Mediation and the Archive as Resurgence**
    - Focuses on the regeneration of educational systems through system-based mediation.
    - Utilizes archival resources to inspire resurgence and renewal in educational practices.
3. **Regenerative Education**
    - Advocates for sustainable and regenerative educational practices.
    - Propogates co-creation in Making, Learning, Reflecting, Sharing
    - Invests in Feedback, Feedforward and Feed up cycles in education and computational system design.
    - Emphasizes the need for an education system that not only sustains itself but also continuously improves and adapts to new ethical challenges.

### Organology

This ethical framework provides a comprehensive approach to explore different body types (individual, social, technical). Following the above and the French philosopher Bernard Stiegler we propose an organological approach towards technology and the non-human in which the articulation of the *human body* (hand, heart, brain, joints, lungs) and *anorganic artificial bodies* (technical storage systems, memory carriers, ai) and *social bodies* (organisations, knowledge domains, institutions, companies, issue-based communities/networks) are seen in conjunction and as co-evolutionary partners. From this perspective XR-AI supported performances and archival agents can be seen and researched as *a collective of moving bodies and 'motion units'*; human bodies performing, art/science consortium performing, anorganical organized systems performing in conjunction with biological organs. This theorisation supports and raises awareness of the continuity of (auto-poetic) feedback loops in creations and collaborations over time in creative research in laboratory setting.

### Ethics of care

Ehics of care can be seen as a manner of connection to others based on the exercise of sensitivity, of affectionate care. The theoretical construction of ethics of care is based on an *anthropology of vulnerability*, taken precisely from the Latin meaning of *vulnus*, which refers



Funded by the European Union

to a wound in *need of healing, attention* and *reparation*. *Vulnerability* is marked by an asymmetrical relationship in power and knowledge, between two parties, a relationship without equality, which is sought to be repaired.

A holistic response to vulnerability with a definition of care is extended to the human and non-human world "*beyond the boundaries of species*" (Rachels, 2003), being nowadays a central approach in the social sciences, in the arts and education domains and it has expanded into environments of coexistence between the human and non-living organisms such as the computational and body-machine interaction, as stated by many attendees to the recent MOCO'24 conference.

In this field, the French author Corine Pelluchon (2018) uses the concept "***ethics of consideration***", assuming by that notion the capacity to live with others respectfully from what they are capable of being and are capable of doing. Pelluchon describes the terms of an education in moral philosophy that would emancipate individuals and help them to promote a different approach from the one we are currently witnessing in economics, politics, ecology. Furthermore, consideration implies that by proceeding accordingly one is also merging the sense of good to the sense of beauty, thus *blending ethics and aesthetics*.

By emphasizing responsibility, awareness, vulnerability, and knowledge transfer, this WP7.4 framework intends to ensure that ethical decision-making is proactive, reflective, and adaptive to changing circumstances in times of crisis. The integration of interdependency awareness, ethics of care and regenerative practices further strengthens the framework's ability to address both current and future ethical challenges within the PREMiERE domain of computational system design, the performing arts and education.

As a reading guide, this deliverable will work as a mapping of ideas, concepts, practices and approaches which IDlab-AHK takes towards art, education and technology. Many of these considerations precede this project and will continue to be explored by the academy after its conclusion. In this sense you are reading one crystallized iteration of a 'living document' which has been written with the intention of further development beyond the scope of the three-year PREMiERE project. The mission of the IDlab is to empower and encourage students to consider critical practice as research and vice-versa. The theoretical frames evinced by this meeting of art practice, technology and organizational systems are thus informed by several years of research and development, of which PREMiERE is part. By connecting the milieu we live in "art and politics with philosophy, an intercultural way of thinking making gradually unfolds in the critique of cynical doom-mongering" (Oosterling, 2016, p.403).



Funded by
the European Union

# III Acronyms and abbreviations

| | |
|---|---|
| AHK | Amsterdam University of the Arts |
| ATD | Academy of Theater and Dance, Amsterdam |
| IDLab | Interdisciplinary Digital Laboratory |
| CASE | Centre for Arts & Sciences Education |
| AMS | Amsterdam Institute for Advanced Metropolitan Solutions |
| MOCO | International Conference on Movement and Computing |
| ICK | International Choreografisch Kunstencentrum |
| STO | Stocos |
| IASpace | Immersive Arts Space |
| ZHdK | Zurich University of the Arts |



Funded by
the European Union

# 1. Introduction

*"Where are we now, where are we now? "*
(David Bowie)

*"Our technical milieu is a collective product, a long-term external memory to which each generation contributes. We cannot act or think without it, and the design and development of our technology is therefore a form of politics that shapes our life-world, our planet and ourselves."*
(Joost Rekveld, 2025)

The route leading up to this executive summary was based on a cyclical interactive process in which the present is continuously viewed as a movement between the past and the future. This deliverable is inspired by philosophy of technology and awareness that the advancing present always moves from the past towards an infinite future (or is it?).

Technologies are not instruments or fixed objects, but moving processes that influence and reinforce social and material matters. "The world moves, and we move with it, in response to it, like a dance. When the world cycles in a certain pattern or a series of patterns, we also cycle in response with our bodies and minds. Patterns do not resemble or copy one another but become *entrained* with one another" (Nail, 2024, p.101). Motion-capture-based research has a long history as it is not separated from the machines, apparatuses or tools that make it possible for humans to do research. "In this way toolmaking technology transformed human minds and bodies, and vice versa" (Nail, 2024, p.148).

Human-technology relations and the way in which we articulate, imagine and understand them are therefore always in flux. In 1985, Haraway proposed the cyborg as an image of the anarchic, category-defying potential of human-machine hybrids, as a myth for resistance and as pointing the way to new connections. She argued that in the development of computing technology since the Second World War, the distinctions between natural and artificial, mind and body, physical and non-physical have become ambiguous (as cited in Rekveld, 2022, p. 63). While Laura Karreman identifies "features of an imaginary that structures motion capture practices; …an imaginary that creates a critical space to consider the assumptions, intentions and fantasies underlying the datafication of human movement" (Karreman, 2026). Performance practice and artistic research thus becomes a (collection of) method(s) with which to inquire and explore this ongoing history of ideas.

Education at the Amsterdam University of the Arts (AHK) is not theoretically isolated from practice, but rather seeks to connect insight and action in an organization where artists can meaningfully reflect and contribute to society. This relation between theory and practice allows holistic understandings of technologies to emerge so that we may move towards a transdisciplinary approach. The structure of this deliverable (loosely connected chapters and sections) is consistent with what it aims to convey: non-linear, network-like thinking and reporting on what moves and motivates us.



Funded by
the European Union

## 1.1 Responsibility: the here and ethical now

The now forces us to frame something new, namely the process of learning, exploring, listening and acting in times of polycrisis when the next generation is growing up with complexity in turbulent times and a sensible awareness of political and systemic failures. Let us not freeze in fear like a rabbit caught in the headlights. We really need not only wonder about the disastrous effects of speed and the climate crisis. In *Où suis je?* (2021) and *Où atterrir?* (2017) written by Bruno Latour, we learn about the lockdown effects for human beings and political orientation in the climate regime; about identity politics, belonging and bubble against bubble. Who is progressive or reactionary? No shared horizon, both global and local seems lost.

Whereas in the past we knew how to behave thanks to moral codes, there is no longer a blueprint for how to approach people. Svenja Flasspöhler sees raising awareness in society as an essential factor in the advancement of civilization. In *Sensibel; over de grenzen van menselijke gevoeligheid* (Flasspöhler, 2024), she wonders about the relationship between sensitivity and resilience.

She proposes four dimensions of sensibility as a framework for exploring themes such as safe spaces, violence and discipline, anxiety, truth, feminist morals, and social regulation.

1. Physical sensibility

Contemporary society has become increasingly sensitive to pain and proximity. The *MeToo* movement illustrates this heightened awareness, due to the coronavirus pandemic, this "fear of touch," to use Elias Canetti's term, has even been virologically legitimized. The appropriate distance to others became a matter of measurement by the meterstick, because during lockdowns, acting and dance classes continued under strict spacing rules. Afterwards, students recoiled from the technological tools that had once sustained education.

1. Psychological sensibility

Emerging from the shift from external to internal compulsion, this dimension combines physical sensitivity with emotional irritability. "Violence" now extends to language and imagery, lowering our tolerance for external stimuli. Debates about *trigger warnings* and the rise of *singularization* (more people living alone) exemplify this inner fragility.

2. Ethical sensibility

Rooted in eighteenth-century philosophy and literature, this concerns the capacity for empathy. It was no accident that empathy became central to modern moral thought through figures like Rousseau and Richardson, according to Lynn Hunt (2007). Today's global movements, from *Black Lives Matter* to *MeToo*, continue this tradition of moral sensitization and solidarity.

3. Aesthetic sensibility

This involves responsiveness to both beauty and ugliness. The refined pleasure of the "eye-person" (*Augenmensch*) and the modern longing for resonance. Sociologist Hartmut Rosa describes this aesthetic resonance as the archetype of a world that still answers and *touches* us. (Rosa, 2017)



Funded by the European Union

Flaßpöhler's aim is to treat sensibility as a dialectical phenomenon: to reimagine its relation to resilience and, in doing so, to formulate new responses to the crises of our time.

> *"We want to be among ourselves, among like-minded people. In short, instead of the vulnerable artist's existence, we now have the vulnerable political existence, which must be spared from the harshness of open debate and hegemonic domination by means of safe spaces"* (Flaßpöhler, 2022, p173).

During and after de lock-down, education at the AHK has had to reorient in terms of physical and digital learning environments and how this hybrid space is experienced by staff, educators and students. Aminata Cairo, formal Lector of Social Justice and Diversity in the Arts at the AHH approaches issues of diversity and inclusion from a wide range of perspectives. Both in her writing (Cairo, 2021) as during workshops and keynote speeches (f.e. Rumbley, L. (Host) & Cairo, A. (Guest). (2020) she's a storyteller by passion elaborating on *Holding Spaces* in present day society and education. Aminata frequently returns to discuss the impact of the Black Lives Matter protests, the greater context of inequality framing our current moment, and the power of the stories we tell ourselves. These sensitivities had to be re-created within our hybrid learning environments, where the real and the digital converge, and students must once again develop resilience. The concept of *holding space*, an intermediate zone between *safe space* and *daring space* supports our organisational responsibility in the here and ethical now.

### 1.2 Awareness: the past and ethical afterness

In *Le Grand Accélérateur* (2010) Paul Virilio refers to CERN and the *Large Hadron Collider* build between 1994-2008 and he explores the notion of ***acceleration*** in contemporary society and its consequences. He delves into the impact of rapid technological advancements and the speed at which information, like the stock market, and events unfold, examining how this relentless acceleration affects human perception, social structures, and political landscapes. Virilio argues that the increasing velocity of change creates a sense of instability and crisis, challenging our ability to process and respond to events effectively.

Virilio predicts that this accelerated pace will lead to a series of crises, as society struggles to keep up with the rapid transformations. He suggests that the speed at which we live and the technological innovations that drive this speed are not only unsustainable but also perilous, potentially leading to catastrophic outcomes if not managed properly. The acceleration of history is not just the increase in the speed of our movements and communications. It is also the increase in the speed at which events occur and follow one another, to the point of giving us the impression of living in a perpetual present, without any possibility of hindsight or reflection.

Although Virilio does not explicitly focus on traditional archives, his critique of the rapid pace of modern life underscores the importance of creating and maintaining spaces (such as archives) where memories can be preserved and reflected upon. This practice is vital for sustaining cultural memory, ***enabling ethical reflection, and counteracting*** the potentially dehumanizing effects of technological speed.

Virilio's critique of ***acceleration and speed*** is a call to slow down. Archives provide a space for this deacceleration, allowing individuals and societies to pause, reflect, and learn from the past. This reflective practice is essential for ethical living and thoughtful engagement with



Funded by the European Union

the world.

Building on Virilio's concern with acceleration, Bernard Stiegler extends the discussion by describing digital technologies as an *absolute pharmakon*—a double-edged force that both disrupts and enables care. In *States of shock: stupidity and knowledge in the twenty-first century* (2015) Stiegler argues that our technical systems, while inherently instruments of acceleration, can also serve as *systems of care* if placed within a reflective, dialogical milieu. Digital media, he suggests, create a new form of "light-time": a temporality in which information from the global data sphere circulates almost instantaneously. This speed radically alters the conditions of thought and memory, risking a deepening of proletarianization—the loss of individual and collective capacity to think and remember for ourselves.

Central to Stiegler's argument is the concept of *tertiary retention*: the idea that all technical supports—whether writing, photography, film, or digital media—store and transmit memories outside the human mind. These externalized memories shape how we think, learn, and remember, becoming part of our shared cultural consciousness. When controlled by industrial and algorithmic systems, tertiary retention risks short-circuiting reflective thought; but when embedded in practices of care, education, and collective reflection, it can instead cultivate attention and memory.

Thus, Stiegler does not simply call for resistance to technological speed but for its reorientation. He envisions a *pharmacological* approach to technology: acknowledging that the same forces that threaten attention and care might also sustain them, provided they are governed by practices of *epokhē,* that is of *absolute slowness*—of suspension, reflection, and shared deliberation. In this sense, the archive becomes not only a site of deceleration but an ethical and political space where digital speed can be converted into attention, where memory is actively curated rather than passively consumed (Stiegler, 2015, p175). Networks of a new sort tend to eliminate delays and distances. 'If the light-time network could remove the delay between the entry of an event as data and its reception by infinitesimally reducing transmission time, the analogic or numeric instrument for data entry also removes all delay between the event and its entry as data. (Stiegler, 2009, p.114). It becomes hard to distinguish between *event, input* and *reception of output:* they have synced. With the growing use of real-time generative AI we are running towards a new epochal time where we enter a media life of continuous technical synchronization, digital presence and remediation value in which we risk what Stiegler calls 'a complete loss of context'. With the synchronization and fusing of event, input and reception of output into one and the same instant, and without a law or judgment, we risk erasing the traces of 'the writing of history' and we risk entering a non-historical world of real-time sensationalism. So 'with the elimination of the *delay* that is the mark of all non-reflexive reflexivity', we risk a complete loss of context. (Stiegler, 2009, p.122)

How to slow down, pause, reflect and learn from the past, while moving forward, generating a sense of *ethical afterness*? The term *Afterness* is coined by Gerhard Richter whose investigation of *Afterness* attempts to recall Walter Benjamin' preoccupation with the concept of *Nachleben* (living on, living after, surviving, afterlive, or following) (Richter, 2011, p.2). As Andrew Benjamin notes on the back cover of Gerhard Richter's *Afterness*; *figures of the following in modern thought and aesthetics*, "Richter develops a conception of time that stills the pathos of utopianism while holding the future open. The possibility of another beginning resides in the recognition that what occurs 'after' is already taking place."



Funded by the European Union

*Awareness* and *Ethical Afterness* is therefore a plea to circumvent the risks of total market dependence on external memory systems outside our bodies and thus the threat of memory loss and self-forgetfulness. In a psychological sense, the degree of autonomy, knowledge, skill, and connection with each other is crucial for (re)generating meaningful and significant experiences.

In chapter 7 of this deliverable we discuss the ethical considerations of motion capture-based research through the making of *Roman & ELIZA,* a collaboration between Ulrike Quade Company and IDlab-AHK. This performance research project centres ethical afterness through the topical notion of digital grief. What happens to our digital data after we die? How can new digital cultures affect mourning practices? In what ways might new technologies rapidly impact our grieving processes? The project is both a mediation on grief and digital legacy in the time of generative-AI. It provides a key opening to the main subject of this deliverable: ethical approaches to carrying out mocap research as well as how techno-artistic performance practice serves to ask key ethical questions of our time, matters of life and death.

### 1.3 Vulnerability: the future of ethical time

Who would have foreseen the current acceleration of Artificial Intelligence (AI) as a psycho-economic accelerator in 2021? Can our brains handle the necessary processing speed for creating, representing, performing understanding, or *(un)learning*? Can our psyche handle being *real-life/virtual-live* and be connected all the time? Even in the afterlife?

In *Autrement qu'être ou au-delà de l'essence (1974)/ Otherwise Than Being, or Beyond Essence*, the philosopher Emmanuel Levinas writes about the relationship between **vulnerability** and **notions of time.** He introduces the idea of **ethical time** as distinct from chronological time (or historical time). He proposes that ethical time is deeply connected to the experience of encountering the *Other*.

In this context, vulnerability is related to the immediacy and urgency of the ethical demand made by the Other. This demand disrupts the linear progression of chronological time, introducing an ethical dimension where the present moment is infused with responsibility and urgency.

**How to make use of ethical time in the act of creation in PREMiERE anticipating an unknown future?** How to 'mirror', connect and share reflective experiences of our moving bodies as virtual self(s) and screen-based agents in contact with the other beings in AR, VR, MR - XR-AI?

### 1.4 Ethics of Care

— By Ezequiel Santos, Forum Dança

**Ethics of care**, as a manner of connection to others based on the exercise of sensitivity, of affectionate care. The concept is associated with (and already liberated from) Carol Gilligan's feminist essentialism, which marked its beginning according to Rachels (2003). The theoretical construction of ethics of care is based on an *anthropology of vulnerability*, taken precisely from the Latin meaning of *vulnus*, which refers to a wound in *need of healing*,



Funded by the European Union

*attention* and *reparation*. *Vulnerability* is marked by an asymmetrical relationship in power and knowledge, between two parties, a relationship without equality, which is sought to be repaired.

A holistic response to vulnerability with a definition of care is extended to the human and non-human world "beyond the boundaries of species" (Rachels, 2003), being nowadays a central approach in the social sciences, in the arts and education domains and it has expanded into environments of coexistence between the human and non-living organisms such as the computational and body-machine interaction, as stated by many attendees to the recent MOCO'24 conference.

Indeed, the need for a responsive individual relationship between those who give affection and those who are the object of that affection goes beyond the dimension of primacy for our fellow human beings and must reach other strangers and other realms. In this field, the French author Corine Pelluchon (2018) uses the concept "***ethics of consideration",*** assuming by that notion the capacity to live with others respectfully from what they are capable of being and are capable of doing. Pelluchon describes the terms of an education in moral philosophy that would emancipate individuals and help them to promote a different approach from the one we are currently witnessing in economics, politics, ecology. Furthermore, consideration implies that by proceeding accordingly one is also merging the sense of good to the sense of beauty, thus *blending ethics* and *aesthetics*.

An approach based on the ethics of care and consideration is especially helpful to devise strategies for people empowerment, achieve fluid and multiple environment collaborations, and address sustainability issues.



Funded by
the European Union

## 2. Plea for hope

This deliverable is a crystallization of activities, mappings and contexts in which we find ourselves (*where are we now?*). It is the start of a living document which foregrounds the process and thus the path towards the final outcome, often the case in the performing arts. As a quest for openings, it will not shy away from attention to political shifts, criticism and crisis, ambivalences and thus uncertainties in society. The overarching aim of wp 7.4 is to strive for a hopeful or ***joyful radicality***. *Joyful radicality* from Latin *rādīcandum*: that which is to be rooted, is inspired by *Sanfte Radikalität zwischen Hoffnung und Wandel* by Jagoda Marinić published by S.Fischer Verlage (2024).We recognise the growing objections against the ever-advancing control of the world by technology, but by *opening up* to the dangers of one's own time this deliverable aims to find an entry point for *hope* as a counterforce to the paralysing effect of fear of technology which we can sense in present day society.

In *The Principle of Hope* (Ernst Bloch (1985-1977) explores how hope functions as a guiding principle, pushing humanity towards envisioning and striving for a better future. He believes that hope is not merely a passive state but an active, transformative force that fosters *creativity*, resistance, and the continual pursuit of improvement in society. A key aspect of Bloch's philosophy is the idea of the "*Not-Yet-Conscious*", which refers to the potential and possibilities that have not yet been realized but are inherent in human aspirations and dreams. This concept underscores the dynamic and forward-looking nature of radical hope, suggesting that the future is open and can be shaped by human actions and imagination. Because...

> *If we trust that art matters?*
>
> *If we can learn from everyone?*
>
> *If we think artists contribute to shaping the world*
>
> *How will we act?*
>
> — Mission statement of the Academy of Theatre and Dance, AHK.

### 2.1 Scope and approach

Within the scope and research of PREMiERE, we focus on ethical questions and considerations that arise from the use of the developed technical applications and the practice of use cases in the restricted laboratory and environment. In doing so, we focus on internal conversation, feedback processes and workshops with participants and target/end-users.

Conducted research in the digital humanities and performing arts around motion capture will be part of the final outcome of this work package within WP7 and will include the recommendation from the mid-term review. This deliverable - considered as a living document - contains the following chapters on Mapping, Motion Units, Technical Extensions of the Body, Entangled Loops of Thinking-Making, Immersion and Pedagogy. Topics covered include responsibility, awareness, vulnerability, plasticity, system-based (re)mediation, regenerative education, hybrid campus, expressive cognition, dataism, organology, care, all of which are seen as roots on which to build aesthetic-ethical considerations within PREMiERE. Those are made relevant for a cross-disciplinary holistic approach towards the



Funded by the European Union

encounter between computational design of PREMiERE technologies and infrastructure on the one hand, and its artistic-creative-pedagogic use by performing arts professionals, students and reception by spectators.

The main recommendation of the reviewers '*concerns the integration steps of the project. Great care should indeed be taken to ensure that not only the individual results are properly integrated to support the 4 use cases, but also integrated in a way that favors usability by the non-technical actors of the performing arts domain after the project ends. The project should really keep in mind integration and usability of the planned outcomes.'* This document aims to contribute to a "fruitful interaction within the scientific community as well as between it and the performing arts.

Yet, this applied approach within the field of PREMiERE cannot do without awareness of the world around us and the context within which we research, navigate and create.

Being in the world as living bodies movement is located within our universe, ecosystem, global, regional, and local context.

*Remember to look up at the stars but don't forget your feet* is a rather playful remedy to Stephan Hawking: *Remember to look up at the stars and not down at your feet.*

Of course, with the intention of continuing to marvel at the mysteries of the universe, space and time and enchantment for what we do not yet know. But time also changes on earth, something which we can also marvel at. For it may be clear who will stand at the forefront of booking flights to Mars when colonisation of the galaxy by tech owners or empires based on ownership and standardisation of all information - data - is completed.

## 2.2 The European Commission: Guidelines, principles, Code of Conduct

The Directorate-General for Research and Innovation has recently published the second edition (April 2025) of the *Living Guidelines on the responsible use of generative AI in research* which is aligned with the ALLEA principles in the *European Code of Conduct for Research Integrity.* This document lays down a set of principles to produce sound research, including ethical aspects. These principles include:

- **reliability** in ensuring the quality of research, reflected in the design, methodology, analysis and use of resources;
- **honesty** in developing, carrying out, reviewing, reporting and communicating on research transparently, fairly, thoroughly and impartially;
- **respect** for colleagues, research participants, research subjects, society, ecosystems, cultural heritage and the environment;
- **accountability** for the research from idea to publication, for its management and organisation, for training, supervision, and mentoring, and for its wider societal impacts.

Generative AI provides many opportunities for different sectors. However, it also harbours risks, such as the large-scale generation of disinformation and other unethical uses with significant societal consequences. According to the European Commission's High-Level



Funded by the European Union

Expert Group on AI (2019), trustworthy AI should be:

1. **lawful** -respecting all applicable laws and regulations
2. **ethical** - respecting ethical principles and values
3. **robust** - both from a technical perspective while taking into account its social environment

This work on trustworthy AI contains a set of ethical principles that were translated into operational requirements for developing AI systems. The requirements could be useful inspiration for drawing up guidelines on the use of generative AI.

The four ethical principles for AI systems are:

1. respect for human autonomy
2. prevention of harm
3. fairness
4. explicability

These principles were used to develop seven operational key requirements;

- Human agency and oversight
- Technical robustness and safety
- Privacy and data governance
- Transparency
- Diversity, non-discrimination and fairness
- Environmental and societal well-being
- Accountability

These ethical principles, values and operational key requirements form the underlying perspective from which the deliverables within Work Package Seven, and specifically PRMR-D7.5, were developed.



Funded by
the European Union

## 3. Mapping of Where We Are

Journalism, education, the arts, healthcare, finance, science, legislation, democracy and thus citizens and the initiating, executing, and controlling powers will have to relate to these powers and counterforce in society in the coming decades. An amalgam of related questions presents themselves such as *who* owns, shares, distributes, process data with what revenue or societal value model? In the **General project review consolidated Report (HE)** the following recommendation is stated:

> *"take into account the gender diversity. The **gender approach** of the project should be updated and should include the representation of non-binary artistic community."*

In the Dutch funding climate, arts organisations, and performance production houses like ICK are required to submit a Diversity and Inclusion (D&I) policy plan. The AHK also has its own D&I chair where D&I is linked to social justice.

> *"Inclusion and diversity in our (ICK) work is about the diversity of bodies that transcend a singular identity. For us, diversity is an intrinsic attitude, a curiosity about different perspectives, brought in through a diverse workforce, both on the dance floor and behind the scenes. By creators who embody diversity or have a specific focus on the disabled body. By partners with reach among diverse audiences ICK wants to reach, and by neighbourhood initiatives in Nieuw West and Noord (Amsterdam). Every body is different and carries a different history. The body is a representation of discourses on sexuality, gender, ethnicity, religion, biology, physicality. It is this representation that can be dissected with dance, put into perspective, thematised."*

This policy perspective of ICK is in line with the values to which IDLab subscribes. This means that the Academy of Theatre and Dance shares these values in the application and selection process of staff and students at the schools, also for the coming years as described in the strategic plan of the AHK 2025-2029 (AHK, 2024). Two examples of this gender-based perspective are documented in Appendix A: the *School of Unlearning* workshop (Figure A1) and the performance project *A Touching Performance* (Figure A2).

***Why, for what*** **and on behalf of-, and for** ***whom*** **are we** ***acting*****?**

This entails *humanity* first; the world is in dire need of a globally/locally shareable radical sense of a shared humanity beyond borders of nationality, creed, skin-color, body types, gender, etc.

It is evident that data- and artificial intelligence-driven automation in our global capitalist society has entered a new phase of digital humanism and debate. Various fields of science are re-examining what makes us human and how digital technologies will affect society and humanity in the coming decades. After all, there is no denying that digital capitalism has increased inequality, polarisation, discrimination, hatred and fake news and thus rightly requires critical questioning of power relations and handling of data. Earth's habitat should not become the economic by-product of what we tend to call technological progress. From academics, journalists, activists, politicians and citizens, there is a call to action for policymakers, technologists and society as a whole to work together to shape an AI future that benefits all of humanity.



Funded by the European Union

Within the *ecosystem of the Netherlands and Amsterdam* partners of the Amsterdam University of the Arts and the Amsterdam University of Applied Science are united in Centre of Expertise Creative Innovation, CASE and AMS Institute and also advocating a balanced view of AR, VR, XM, XR, AI's and its potential for future affairs and design. Recognising the dangers to human well-being, civil rights. They are advocating transparency, accountability, and a human-centred and issues-based approach to AI development. By focusing more explicitly on ethical principles, regulatory frameworks, and *ethics of care* and inclusive accessible technologies. Potentially, AI can be a powerful tool to improve human rights and bring about positive social economic change but can also have destructive effects when used irresponsibly by profiling humans as data and damaging people's environment, psyche, soul, well-being, and livelihood.

## 3.1 Intentional encounter between domains in PREMiERE - interdependency awareness

The research around motion capture, XR and AI within PREMiERE is strongly linked to Aristotelian time, space, action but also relation between and within the two distinguishable domains (art - computer science) and thus practices and *intentions* of knowledge transfer and movement. *Dialogues Between Artistic Research and Science and Technology Studies (2020)* edited by Henk Borgdorff, Peter Peters, and Trevor Pinch is a comprehensive exploration of how artistic and scientific research methodologies can intersect and inform one another. It provides valuable insights into the potential for interdisciplinary collaboration and the creation of new knowledge forms that transcend traditional academic boundaries. It foregrounds *dialogue*, *practices* and *experiments*.

Technology partners research and develop with some distance from end users within their own science domain with more theoretical building blocks of *knowledge, logic,* and *structures* than makers and artists for whom the physical live encounter with the audience in a joint space is central. The performative transitory practice of the performing arts, when it revolves around data, recording, storage, distribution, and re-mediation, entails a phenomenological fascination with the present, as well as the past and future. In which *embodied knowledge, experience* and *perception* define movement research and related epistemological perspectives. Art researchers in the humanities embrace critical theory while performing artists are *sensorial, physical, emotionally creative anticipatory in the moment while experimenting* rather than *structurally cognitive, analytic, mathematical,* and *consequential* like researchers in the domain of information technologies. But choreographic and movement research shows that practitioners are aware of this dichotomy and avoid this separation because it includes territories of intersection (i.e. movement analysis, rigorous bodily discipline, corporeal language and argumentation, choreographic logic, creative intuitive algorithmic invention etc.).

These differences between approaches to research-creation in technological fields versus artistic fields became evident during the XR theatre experiment. Planning for the interdependent yet differing needs of both domains is key for techno-artistic processes such as this to thrive. These issues shall be elaborated further in chapter 7 of this deliverable.

Collaborations between performing arts practitioners and computer science researchers requires investment in cross-cultural understanding, awareness, and co-creation. Dynamic



Funded by the European Union

and flexible planning requires ***inter*** *dependency awareness*, trust, agility, and empathy. In the collaboration, the implementing partners seek to emancipate and strengthen the importance and relevance of the intuitive body (see Deliverable 7.2), and education. In this way, *the why* behind movement can lead while the technology follows.

The PREMiERE project has been drawn up explicitly as a tech-development project and the consortium is clearly tech-heavy. An art-science epistemological dialogue has gradually emerged from the consortium which is a positive development. This was also appreciated in the mid-term review report: *"...,the consortium have shown strong integration and relationship between technical partners and end-users,.."*.

A co-evolutionary relational balance requires equality and open relationships in which alignment to each other is conditional for progress. Through interdisciplinary and transdisciplinary encounters, the research for all parties is exploratory, speculative, and values-driven. This is an important development for (arts) education to advance understanding of which methods can be employed to study the ethics of human/digital tool or art/science interactions in more detail.

Such an approache has been explored in various workshops and a demonstration of free style dance interacting with generative algorithms and sonification with body sensors and SuperCollider, as documented in Appendix A – Figure A3.

## 3.2 The archive as resurgence

The performing arts at its core is an ephemeral, live art form wherein the presence of the spectator(s) is conditional. In terms of regenerative knowledge transfer and archiving, system-based (re-)mediation attracts and carries a promise. After all, a key question for the performing arts during times of Covid-19 was: *where is our future stage and where do we meet our audience?* It is within this context that PREMiERE aims to support/facilitate the extension of a lifecycle of performing arts.

How the lifecycle of performing arts may be integrated, and to promote an encounter between the human, the performance, and a system of mediation may be illustrated by cases of archival activation. For example, in *artivation (artivação*) mode, an existing dance recording from the past is retrieved from its stationary place and becomes a present source of inspiration for future art works. Artivação, in Portuguese, is the imaginative appropriation of the archive materials and cataloguing leading to a performative event.

In those forms known as ***performative archiving***, the curator sets in motion all numbered items (e.g., video and voice recordings, memorabilia, media objects) and together with the audience activates body resonance between past performance and present viewing experience, thus creating a living device by enhancing the energy of the whole. Within said lifecycle not only the archive ceases to be dead and in a perpetual past tense, but it can also be articulated with the timeline of a new creative process in dance and the ephemeral time of the performance or installation art-work. From this possibility an encounter arises: between the constituent time of the work, and the energy of human bodies that is intensified and spread in space (*artistic atmosphere*). And this may possibly be prompted by a basic system of (re)mediation, or method with a technology toolbox.



Funded by
the European Union

The concept of ***archive as resurgence*** exposes how these performative archive events have both an aesthetic and ethical effect, contributing to diffusion of relational and social values. The archive encompasses both theoretical and practical concerns. In the traditional sense, an archive supports the conservation of materials of an artistic or academic nature. PREMiERE has created digital tools and preservation strategies to improve this archival function for the intangible heritage of the performing arts. Yet the archive is also conceptual, it is a system of codification that actively shapes the narrative and lifespan of a particular artistic or academic work. Practices of archiving informed by a myriad of social values, aesthetic choices and epistemological standpoints which together give shape to a system of heritage transmission (Santos 2024a).

Ezequiel Santos and the team at Forum Dança approach the archive from a dance perspective beginning with the question: how to archive an art form that is created with the body? Drawing from the phenomenology of movement and aesthetics of reception, their archival practice is one which centres what they call "resurgence." They consider archival products as an extension of the creation process. In this way, bodily resonances are produced when spectators come into contact with an artwork creating certain affective states and synesthetic sensitivities. A performative mode of archiving seeks to recover the body's energetic core and make it resurface in a spectator's encounter with the archive. For example, artefacts can become "activated" when presented in an exhibition space alongside and through dance performance. (Santos 2024b, pp. 3-4).

Throughout 2025, this concept of ***archive as resurgence*** has been transferred to community practices promoted by The Forum Dança team through archival curation, honouring teachers and artists whose vision drove the development of contemporary dance in Portugal. These were collective moments driven by the archive, conceived as a living space for artistic practices and reflections to meet. Between 17 and 22 February, "Para a Cristina" [For Cristina] was the title of a tribute to Cristina Santos (1959–2024), a ballet dancer and teacher who was one of the founders of Forum Dança in 1990. "Para a Cristina" was an opportunity to share, reflect, discover, and create together. As mentioned in the programme,this event was alively community celebration and a meeting place for artists, thinkers, and the public: Para a Cristina – Forum Dança

On 20 and 21 February Forum Dança marked the first anniversary of the death of Steve Paxton (1939–2024), a figure who left an undeniable impact on the trajectory of Portuguese contemporary dance: For Steve – Forum Dança

Furthermore, two experiential city routes were created by Ezequiel Santos, based on historical dance archives: CUMPLICIDADES

Percursos 2.0 [Routes 2.0] is a project conceived to activate the memory of dance throughout Lisbon. It was presented at the Cumplicidades International Contemporary Dance Festival between 14 May and 1 June. Percursos 2.0will be resumed at the end of the 2025/2026 academic year -now under the new title "Percursos.edu" - through an agreement between the production structure EIRA and eight dance schools in Lisbon: four offering official training (two at elementary level, two at university level) and four with independent curricula.



Funded by the European Union

## 3.3 Regenerative education

Given that this task WP7.4 relates to WP7.2 and is carried out by the AHK, this means that the focus will be on educational developments, social and relational values and regenerative education. Regenerative education is an emerging field that seeks to address the interconnected socio-ecological crises by fostering educational practices that promote sustainability, equity, shared responsibility and holistic personal development. This approach integrates ecological, social, cultural, psychological, and spiritual dimensions to transform educational systems and practices.

> "*We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely.*" (Wilson, 1999, 125)

Twenty-first century education represents a paradigm shift in pedagogy and arts education, emphasizing holistic development, ecological integration, and transformative learning practices to address contemporary global challenges. Regenerative education is a branch of educational theory and practice that reimagines the roles of educators and learners in society. With the aim of securing a sustainable future for planetary life in the face of an extractivist world order, it recognises the need to transform how humans relate to one another and the more-than-human world. This has prompted the development of educational initiatives which focus on the building of meaning, connection and a sense of purpose within and between students while emphasizing system change, collective responsability and societal impact. In this sense, regenerative education is an inherently relational approach to thinking and being in the world (Rens Wessels & Grunwald, 2023).

As opposed to traditional educational paradigm of educating individuals to integrate them into a growth-based economy, regenerative education describes a new way forward: "Education for regenerative cultures is about the life-long process of enabling and building the capacity of everyone to express their unique potential to serve their community and the planet and in the process serve themselves" (Daniel Wahl in Ciarlo, 2020).

Regenerative education consists of the following principles:

- emphasizes the progressive improvement of individuals—body, mind, and spirit. It aims to unlock each learner's unique potential to serve their communities and the planet, fostering a deep sense of purpose and agency.
- promotes ecological literacy and relational ways of learning. It often involves place-based education, ecological literacy, and the integration of local environmental and community challenges into the curriculum.
- includes practices such as various active conversations to navigate and reflect on pedagogical paradoxes and personal development.
- is designed to be self-directed and community-oriented, breaking down traditional institutional barriers.
- focuses on transformative learning experiences that cultivate critical thinking and personal growth. It leverages experiential learning and reflective practices to help learners understand and influence their social and ecological contexts.



Funded by the European Union

- involves innovative practices such as:
    - **Living Labs and Field Labs**: These are practical, community-engaged learning environments where students work on real-world challenges.
    - **Narrative and Podcast-Based Inquiries**: Using qualitative methods like podcasts, educators and students explore and disseminate practices and stories, promoting broader engagement and understanding.

For the role of art education in technological imaginaries, see also section 6.1.

As a proponent of regenerative education, the IDlab shares the above values in its emphasis of the transformative power of socially-engaged artistic research. Learning by making and sharing is the social aesthetic-ethical principle of the *Interdisciplinary Digital Laboratory* (IDlab) of the Academy for Theatre and Dance (ATD) and the AHK's Research Centre. It applies to curriculum development within the academy; circular thinking, agile, flexible and iterative development of educational offerings where practice equals research ie. Praxis (for further exploration of Practice equals Research see Chapter 6). As ATD associate Lector Anthony Heidweiller argues regenerative art education is a repositioning of artist training in which beliefs, ambitions and thought patterns are geared towards sustainable social change. "The artist of the future sees the dialogue with society and care for the earth as the basis for personal artistic growth" (2025). It is this reciprocal relationship, between the arts and social-environmental justice, that ATD strives to cultivate through making, learning, reflecting and sharing together.

Regenerative education prioritises Feedback, Feedforward and Feed up dynamics, it is the educational variant of what Erika Fischer-Lichte has described in the field of theatre studies as the *autopoietic* feedback loop between performer and spectator. In the *Transformative Power of Performance* (2018) Fischer-Lichte argues that a feedback loop – as a term that refers to the ongoing interactions between actors and spectators in performances - is provided in any performance event but since the performative turn of the 1960s it came into the fore and 'contingency became a central aspect of performance' and the spectator(s) became a co-constitutive productive force. This *autopoietic* feedback loop between performer and spectator can also be applied to the maker/researcher and participants/students in an educational setting. The application of this concept to the making process of artistic research will be further developed later in this deliverable, see chapter seven.



Funded by the European Union

# 4. 'Motion Units'

**The complex reality of embodied movement, cognition and knowledge transfer**

*This task, Wp7.4, examines the ethical implications of the digital motion capture of human movement. Ideas about human bodies and how they move are often normative. The way in which digital movement is mapped onto robotic and virtual bodies is, therefore, an area requiring critical attention. Motion capture allows us to see movement as something that you can divide into building blocks, as* ***'motion units'*** *that you can combine in many different ways to shape new movements. This task brings to the surface what remains underexposed in this vision****: the complex reality of embodied movement.*** *What does that body look like, what is its identity, how is it trained, how is it directed and with what intentions the movement is executed?*

## 4.1 The uniqueness of the body

**Questioning representation and information as raw material and commodity**

Due to the inevitable reduction of the complexity and phenomenological 'indivisibility' of the body, there is often a certain degree of scepticism or aesthetic-ethical objections among performers, choreographers/directors and therefore spectators when using media and more recently motion capture technology. That scepticism may even increase given ChatGpt, Dalle-E, Stable Diffusion AI, and growing objections against the (mis)use of non-copyrighted creations. After all, and these data are used as raw material for synthetic creations and invisible realisation of vast datasets for the development of large language models and generative AI.

The MOCO'24 Conference organized by the Utrecht University with the theme *Beyond Control* took place Thursday 30 May - Sunday 2 June 2024. Host and chair Laura Karreman invited researchers and keynote speakers with the following questions in the call for proposals.

> *"How can arts and performance be understood as a place for exploration and inspiration, as a 'testbed' for new ideas relating to movement and computing? We invite you to share how your research navigates these and other challenges. What new concepts and methods emerge from making sense of new entanglements between human and non-human agents, either created in your own practice, or as observed in other settings? What could be ways of movement computation that subvert the cultural logic of control, and explore the critical space that lies beyond?"* (Karreman, 2024)

## 4.2 Embodied knowledge: movement & cognition

Theories of the complex reality of **embodied movement** often stand in relation to **embodied cognition theories.** Embodied cognition suggests that cognitive processes are deeply rooted in the body's interactions with the environment. Some theories and perspectives of embodied cognition can be found in the phenomenology of dance, dynamic systems theory,



Funded by the European Union

4E cognition, pedagogy, *neuroscientific* research, and hybrid intelligence.

**Phenomenology and Dance**: Studies in the phenomenology of dance explore how movement can communicate and shape cognitive experiences. This perspective suggests that dance and other forms of embodied movement are not just physical activities but also cognitive processes that involve understanding, intention, sense- and meaning-making. Dance, in this view, becomes a form of embodied cognition where movements are both a result of and a contributor to cognitive processes (Welch, 2020).

**Dynamic Systems Theory**: Linda Smith and Esther Thelen propose a new theory of the development of cognition and action, unifying recent advances in dynamic systems theory with current research in neuroscience and neural development. They posit that cognitive development emerges from the dynamic interactions between the body and its environment. Infants develop motor skills like reaching by interacting with their physical surroundings, which in turn shapes their cognitive development. This theory emphasises how bodily movements generate changes in cognitive systems through continuous feedback loops.

> "*We propose here a radical departure from current cognitive theory. Although behavior and development appear structured, there are no structures. Although behavior and development appear rule-driven, there are no rules. There is complexity. There is a multiple, parallel, and continuously dynamic interplay of perception and action, and a system that, by its thermodynamic nature, seeks certain stable solutions. These solutions emerge from relations, not from design. When the elements of such complex systems cooperate, they give rise to behavior with a unitary character, and thus to the illusion of structure. But the order is always executory, rather than rule-driven, allowing for the enormous sensitivity and flexibility of behavior to organize and regroup around task and context.*" (Thelen & Smith, L. B., 1994, xix)

**4E Cognition:** This framework includes four interconnected concepts—Embodied, Embedded, Extended, and Enactive cognition. It suggests that cognitive processes are not confined to the brain but involve the entire body and its interactions with the environment. This approach highlights how bodily movements and sensory experiences contribute to cognitive functions such as perception, memory, and problem-solving (Gallager. 2023).

**Pedagogy**: In *Movement Matters: How Embodied Cognition Informs Teaching and Learning* experts translate the latest findings on embodied cognition from neuroscience, psychology, and cognitive science to inform teaching and learning pedagogy. Embodied cognition theories have practical applications in education, where movement-based activities are used to enhance learning. Sheila L. Macrine, one of the editors, incorporates phenomenological insights to bridge cognitive science and educational practices. Movement Matters aligns with phenomenological views that stress the embodied nature of human experience. These contributions provide a philosophical and theoretical foundation for understanding how movement and sensory engagement can enhance educational outcomes (Macrine, S.L. & Fugate, J.M.B. 2022).

**Neuroscientific research**: is not by definition neurocentric as Shaun Gallagher notes: "one can acknowledge the importance of what the brain is doing, operating as part of a larger circuit that includes body and environment. The brain is not at the center of a circle with radii of control extending to other elements; it is one component arranged in the circuit."



Funded by
the European Union

(Gallagher, 2018)

**Hybrid Intelligence**: Once the ethical implications of XR and AI as 'motion units' in motion-capture-based research are questioned within PREMiERE, another field of research enters the arena: hybrid-intelligence. Hybrid intelligence refers to "the combination of human and machine intelligence" the goal of which "leverages the complementary strengths of humans and AI to create systems that augment, rather than replace, human decision-making and creativity" (Lutz et al., 2025). . The aim of hybrid intelligence is to achieve goals which would have otherwise been impossible by humans or machines alone in teams where humans and machines operate synergistically. To do so, Hybrid Intelligence requires building artificial systems that take human expertise and intentionality into account. Ethical, social and legal considerations and values must be translated and integrated into fundamental design of these systems (Akata et al. 2020).

It is therefore relevant to explore an integrated or holistic approach to the movement and embodied cognition of human beings in relation to anorganic intelligent systems developed by human beings. Developments in the field of AI have not only caused anxiety and panic, but also raised new insights into thepotential of human-machine collaboration. In this way, we take after Katherine N. Hayles by considering theories of hybrid intelligence alongside the 4E framework of cognition, whereby cognition is not an activity solely possessed by human actors. Cognition is instead distributed across human and technical agencies through "dynamic flows between human, animal and machine" (2006).

## 4.3 Distributed Cognition: The 4E's & Hybrid Intelligence

The 4E framework of cognition entails a more detailed articulation of distributed cognition. It entails the following models:

- *E*mbodied cognition emphasizes that human thinking is deeply influenced by bodily experiences and movements. AI systems can be designed to track and analyse human bodily processesenhancing human-computer interaction. For example, wearable devices that monitor physical health and provide real-time feedback illustrate how AI can complement embodied cognition by integrating bodily data into cognitive processes.
- *E*mbedded cognition focuses on the role of the environment in shaping cognitive processes. AI can act as an embedded cognitive agent within the environment, providing contextual information and support (f.e. creativity). Smart environments equipped with sensors and AI can adapt to the needs of the users (f.e. performers), thus creating a dynamic interaction between humans and their surroundings.
- *E*xtended cognition posits that tools and technologies extend our cognitive capabilities. AI technologies such as virtual assistants, augmented reality (AR), and brain-computer interfaces (BCIs) exemplify how cognitive processes can be extended. These tools augment human abilities by providing additional memory, computational power, and real-time data analysis, effectively extending human cognition beyond its natural. See Clark & Chalmers seminal 1998 essay "The Extended Mind".
- *E*nactive cognition stresses the importance of perception and action in cognition,



Funded by the European Union

where sensory and motor activities are interlinked. Robotics and AI can work alongside humans in performing tasks that require coordination between perception and action. For instance, AI-driven robots in manufacturing or surgery can work interactively with humans, where the enactive cognitive processes of humans are complemented by the precision and consistency of AI systems. See Varela, Thompson and Rosch's 1991 *Embodied Mind* (Newen et al. 2018).

By approaching the 4E framework with the aims of hybrid intelligence and grounded by *ethics of care*, we can see a more comprehensive and relational picture of cognition that includes both human (movement) and artificial elements. AI can enhance human cognitive processes by providing additional tools and capabilities, while humans can offer the embodied, context-aware, and adaptive aspects that AI currently lacks. This synergy can lead to more effective problem-solving, learning, and interaction in various domains, from performing arts education and healthcare to everyday life.

### 4.4 Expanding 4E Cognition

The 4E Cognition framework emphasizes the role of expressive activities—such as language, art, and other forms of creative expression—in cognitive processes. Expressive cognition focuses on how these activities not only communicate thoughts and feelings but also shape and constitute cognitive processes themselves. Key aspects of expressive cognition are:

- Language and Communication: Language is a primary form of expressive cognition. It allows for the articulation of thoughts, emotions, and intentions, which in turn shape how we think and interact (perform/dance/act) with others. (Body) Language is not just a medium for expressing pre-formed ideas but is integral to the formation and transformation of those ideas.
- Art and Creativity: Artistic activities such as drawing, painting, music, and dance are forms of expressive cognition. They involve the use of the body and mind in creative ways, often leading to new insights and emotional understanding.
- Social Interaction: Expressive cognition is also evident in social interactions, where gestures, facial expressions, and body language play crucial roles in communication and understanding.

Expanding 4E Cognition arises from the idea that the why, when, where, how and with and for whom you might want to engage in knowledge transfer touches on intrinsic motivations and intuitions that are more likely to be harvested from creating, doing and reflection. Miranda Anderson speaks of the way in which the arts uniquely harnesses certain cognitive capacities, that is the human capacity to imagine beyond the limits of present realities. By dynamically reconfiguring mental horizons, the arts can spur on our cognitive processes and give rise to new knowledge through acts of creative imagining (2022).

Expanding the 4E Cognition model acknowledges that expression and the creation process is not merely a by-product of cognition but a fundamental aspect of how we think, feel and experience the world. Given the innate subjectivity and culturally-socially-historically specific conditions of this extra cognitive field, the inclusion of expressive cognition in the 4E model nurtures the need for non-normative ethics that arise on a situational basis.



Funded by the European Union

## 4.5 Adoption over Adaption

As one example of expanded modes of cognition through expression, the Art/*Computational Media*/Science encounter between choreographic and theatrical practices and XR, AI such as large language models (as intermediate anorganic beings) opens new possibilities for exploring the 'birth' of hybrid intelligence and the emancipation of "the intuitive body" (ICK) within system-based knowledge transfer.

The conversation around dance knowledge transfer through/via virtual space is relevant to diverse choreographic signatures and practices; from classical ballet to (expanded) contemporary dance (Bleeker, 2017). The embodied historical and contemporary knowledge of dancers/choreographers and its transmission typically passes through non-verbal bodily articulation and a presence based "meta-language". Research into how to notate, document and transmit this "meta-language" finds a multiplicity of individual expressions and is based in the first place on intuitive, subjective corporeal experiences. It explores translation of movement logics into other modes of writing and communication such as the symbolic, the metaphorical or the verbally descriptive – or a multimodal combination thereof. In dance knowledge transmission, the living reality of idiosyncratic corporeal articulations of the "meta-language" of dance is paramount. This living reality resists and surpasses pre-defined and homogenized database structures that seek to capture essentials of dance through its datafication in the form of motion units. The dialogue between signature specific ways of articulating dance language and generalizing data schemes that are necessary to apply analytical structure to big data bases sparks a renewed interest in articulating new parameters for universally valid parameters across various dance languages.

A basic principle that is also receptive to collaboration and learning how and why to speak in data, "the lingua franca of our time", can be found in the **adoptive** transformation of hybrid intelligence (human-machine relations). It is precisely in this participatory intermediate position between art and science that opportunities can be found for self-determination and thus preservation of diversity in the systems to be designed. This contrasts to being **adaptive** which implies emulating automated simplification, standardisation and representation of moving bodies invented and designed solely from calculation and economic interest. Adoptive transformation seeks resistance to human subjectivation as merely a set of data. "…nothing is more effective than creating new environments that allows individuals and collectives to become autonomous agents, in the sense that, instead of adapting to the environment, they could adopt it as a means of self-realization." (Hui, 2024, p. 220)

A concrete example for an adoptive approach in PREMiERE is how the most recently developed version of the AI Toolbox was transmitted from STO to the creative team at ICK in their experimental new research-creation *Nous Le Radeau* which premiered in December 2025 at Cité de la Musique in Paris. Through the adoptive creative application of this technology in another creative context, the technology is further developed and transformed from the critical perspective of the artistic directors of ICK and for the purpose of a new collective creation. At the same time, ethical considerations related to intellectual property rights and the thin line between the open-source sharing of software and unique artistic authorship has been investigated and treated within the consortium on the basis of mutual trust and support.



Funded by
the European Union

Stiegler is known for his work on technology, memory systems, politics, education and its relationship with our society in a 'state of shock'. Stiegler is influenced by the phenomenology of Edmund Husserl, Gilbert Simondon's mechanology and Jacques Derrida's deconstructivism and he explores the concepts of being "*adaptive*" and/or "*adoptive*" within his broader discussions on (collective) individuation and capitalism (Ross, 2021, p. 148). To understand these terms in Stiegler's philosophy, it's crucial to place them within the context of his overarching themes, particularly his critique of contemporary technological society and his emphasis on the need for a transformation in the way we engage with technology.

### Adaptive

In Stiegler's framework, "adaptive" refers to the ways in which individuals and societies adjust to the technological environment imposed upon them. This adaptation is largely passive and reactive, where human behaviour is shaped by the demands and constraints of technology without a critical or creative engagement. Stiegler argues that such passive adaptation can lead to a loss of individuation and a diminished capacity for critical thinking and creativity. It can result in a state where individuals become mere consumers, shaped by the dictates of a consumerist and technocratic society.

### Adoptive

On the other hand, "adoptive" engagement with technology, as posited by Stiegler, involves a more active and critical stance. To adopt technology means to integrate it thoughtfully and creatively into one's life, reshaping it to serve individual and collective goals rather than merely conforming to its dictates. This process requires a reflective and deliberate engagement, where technology is not just used but is transformed and repurposed to foster genuine individuation and collective well-being.

"It is clear to Stiegler that digitalization radically transforms the very conditions of the pursuit of knowledge, and hence that we must rethink the practices of this pursuit in such a way that it becomes possible to adopt these new technologies rather than merely adapting to them. This implies both a transformation of the very idea of the university and a form of research that would be, not just theoretical, but capable of undertaking experiments aimed at a renewal of research itself, and of doing so on the basis of the invention of new instruments" (Ross, 2021, p148)

This basic principle of adoptive transformation also underpinned the process and creation of PRMR - D7.2- Digital Tools for Dance Education, see also the figures in Appendix A. Workshops and Training Sessions.



Funded by
the European Union

# 5. Organology and the co-evolutionary relation of bodies

*"Stiegler is a thinker who practically engages in creating his own brand of digital weapons to contest the loss of hope in modern society. ...In his pharmacological critique of technology we find a distinct economy of contribution. Such an economy looks at how technology can be used to reconstruct splintered social relations, which can in turn rebuild attentional, intergenerational circuits between student-and-student and student-and-teacher."* (Bradley & Kennedy, 2021, p. 97)

Following the French philosopher Bernard Stiegler we propose an organological approach towards technology and the non-human in which the articulation of the *human body* (hand, heart, brain, joints, lungs) and *anorganic artificial bodies* (technical storage systems, memory carriers, ai) and *social bodies* (organisations, knowledge domains, institutions, companies, issue-based communities/networks) are seen in conjunction and as co-evolutionary partners. From this perspective **XR-AI supported performances can be understood and researched as *a collective of moving bodies and 'motion units'***; human bodies performing, an art/science consortium performing, and anorganical organized systems performing in conjunction with biological organs. This theorization supports and raises awareness of the continuity of auto-poetic feedback loops in creations and collaborations over time in creative research in laboratory settings, see Figure D2 in Appendix D – Pedagogical Visualisations. Feedforward and feed-up circularity loops are used in education and international classrooms and specifically at the AHK, Academy of Architecture following Biggs constructive alignment with feedback (Biggs, 2022. Snel, 2023).

## 5.1 Organology as theoretical framework

The consequence of theorising *organology as a framework* for the ethical implications of motion capture will need more elaboration, but what is evident is that it is not detached from a historical line; from media history and the archaeology of system-based media towards an unknown future about what XR and AI *will set in motion*. It does, however, assume that the whole body in conjunction with representation and aesthetics holds powerful ethical potential for action and communication. It shows that vulnerability affects empathy and mutual understanding and therefore is an opening to the future.

**Past - awareness ⟷ present - responsibility ⟷ future - vulnerability**

In contrast to *existential ethics*, *care ethics* is not about self-care, but about caring for others. Care ethics is based on a relational view of humanity and on the idea that humans are dependent and vulnerable beings. Whereas personal development within existential ethics focuses on independence and self-determination, care ethics takes a fundamental approach to caring for others. (Dohmen, 2022, p.569) In contemporary thought on care and formation, a coherent line can be traced beginning with Carol Gilligan (1982), whose work marks a decisive break from the dominant paradigm of *behavioural ethics* — a framework that centred on rule-following, measurable actions, and universalised principles of right conduct. Against this backdrop, Gilligan reframes morality as an inherently relational endeavour. She disrupts the individualistic moral paradigm by showing that ethical life emerges within concrete dependencies, in attentive responsiveness, and through the subtle labour of attunement to others. With D. W. Winnicott (1960/1965-1971), this relational orientation shifts into developmental psychology, where care becomes not merely a moral notion but the very



Funded by the European Union

condition of subjectivity: a *holding environment* in which the self can come into being, play, falter, and recover. Bernard Stiegler (1994–2020) radicalises this environment by revealing it to be always already technically mediated; in an age in which attention is commodified and time fragmented, care becomes a pharmacological task; the work of sustaining the conditions that make human becoming possible, rather than supporting the individual alone. Where Gilligan thus offers a relational-ethical view, Winnicott a relational-psychological one, and Stiegler a technopolitical and temporal one, Henk Oosterling (2013/2020) renders the picture socio-ecological: care becomes a practice of interconnectedness, not only between people but also between people, things, infrastructures, time, and space.

Memory systems and system-based accessibility to knowledge of the past, are increasingly placed outside our bodies and 'we' should take care that these will not be placed in the hands of the market and the power of the big tech with their vendor lock-in strategies. Because it denies and negates the power and depth of real life embodied knowledge transfer and even indigenous knowledge. This is precisely why PREMiERE and its toolbox can be also seen as a *playground*, an emancipatory impulse towards techno-diversity and thus recognition of the intuitive, living, breathing body in the ongoing exploration and developments of technological tools of perception.

The biologically and at the same time socially, culturally, historically evolved bodies of performers stand for drives and values that can play a guiding and meaningful aesthetic-ethical role when **AR/VR/MX - XR/AI** are dealt with as **technical and societal bodies.** In between living bodies (organized beings of biology) on the one hand and things (inorganic beings of the physical sciences) on the other, Stiegler positions a third genre of being: technical objects (inorganic organized beings). (Stiegler, 1998, p17)

Technical objects can fuel individual and communal artistic practices and educational organizations and labs working within the cross-disciplinary domain of an ever-evolving field of immersive arts. Stiegler's theory of organology posits the intersecting relationships between technology, society, and the human mind.

- **Technical Organology** - The study of technical objects and systems also known as technics. The proliferation of digital technologies, AI, and automation affects almost every aspect of modern life. Stiegler's analysis of technical systems helps us understand how these technologies shape and are shaped by human practices.
- **Social Organology** - The study of social structures and institutions. The integration of these technologies into social structures has led to significant changes in employment, education, and communication. Stiegler's insights can help analyze the transformations in social institutions and the economy driven by technological advancements.
- **Human Organology** - The study of human individuals and their psychological processes. On an individual level, the omnipresence of digital devices impacts cognitive processes, attention spans, and social interactions. Stiegler's focus on how technology affects human psychology is crucial for understanding these changes.

Against the domination of marketing and the hegemony of capitalism, which regresses our



Funded by the European Union

societies, Stiegler propagates a change of model moving from a consumer society to an economy of contribution. In this new epochal time where humans need to adjust themselves to the constant acceleration of digital technologies and globalisation it is important to find ways to counterbalance the market and financial capitalism that controls this digital revolution. Stiegler believes in the necessity of this passage to act and argues that we need to invent a different industrial society in service of the human, and not in service of capital. Our technologies are not exterior to human beings but fundamentally interior to them; they've become **co-constitutive** matter. (Roy, 2012).

A Venn diagram can be an effective way to illustrate the interconnections between them:

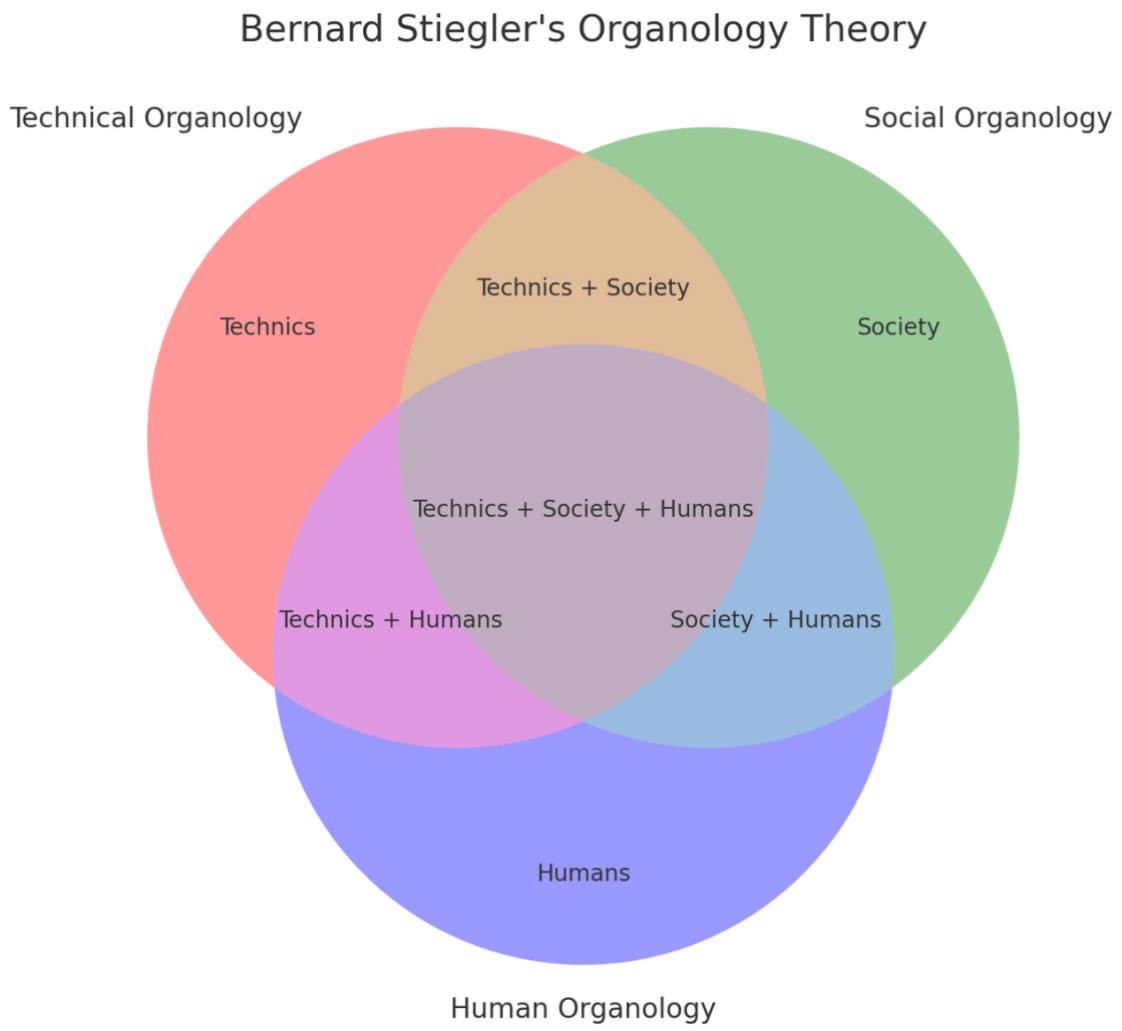



**Figure 1.** Venn circle visualisation of Stiegler's Organology Theory. Erik Lint, (2024).

These three elements, the technical, the social and the human, overlap and interact with each other, forming a complex network that Stiegler explores in his theory.

- **Technics + Society:** The way technical systems influence and are influenced by social structures.
- **Technics + Humans:** How technical systems interact with human psychology and behavior.



Funded by the European Union

- **Society + Humans:** Shows the relationship between social structures and human individuals
- While the complex interplay between all three elements is **Technics + Society + Humans**

Bernard Stiegler does not present organology as an operational research method in the classical sense (such as discourse analysis). Rather, it functions as a diagnostic philosophy that examines the co-constitution of human beings as living organs, technical organs (tools, media, infrastructures), and social organs (institutions, norms, practices) in their historical and dynamic interplay. While organology provides no step-by-step protocol, codification, or replicable procedure, its conceptual architecture offers a coherent orientation that can inform and structure a theoretical framework for psycho-socio-technical analysis. General organology establishes a *theory* of *technical life*, conceived here as a process which is '*indissolubly psycho-socio-techno-logical*'. General organology is also a framework that makes possible *transdisciplinary approaches*, 'which does in general *modify both psychosomatic and social organizations…in a way that raises completely new questions:…*(Stiegler, B. 2020, p73).

Bernard Stiegler's theories have been applied concretely in various fields, particularly in media studies, philosophy of technology, education, engineering, architecture and cultural analysis. In media studies his idea of **tertiary memory (**how technical objects store and transmit memory) has for example been used to understand the role of cinema in shaping collective memory and individual consciousness (Roberts, 2012). At Delft University of Technology, Gorny and Radman in 2022 also embraced Stiegler's methodology and framework as a means to articulate processes of differentiation that "historically make humans who they are." They created a conceptual network and visualisation of key terms for theorising the co-evolution of socio-techno-environmental assemblages, within and beyond Stiegler's *Technics and Time:*



Funded by
the European Union

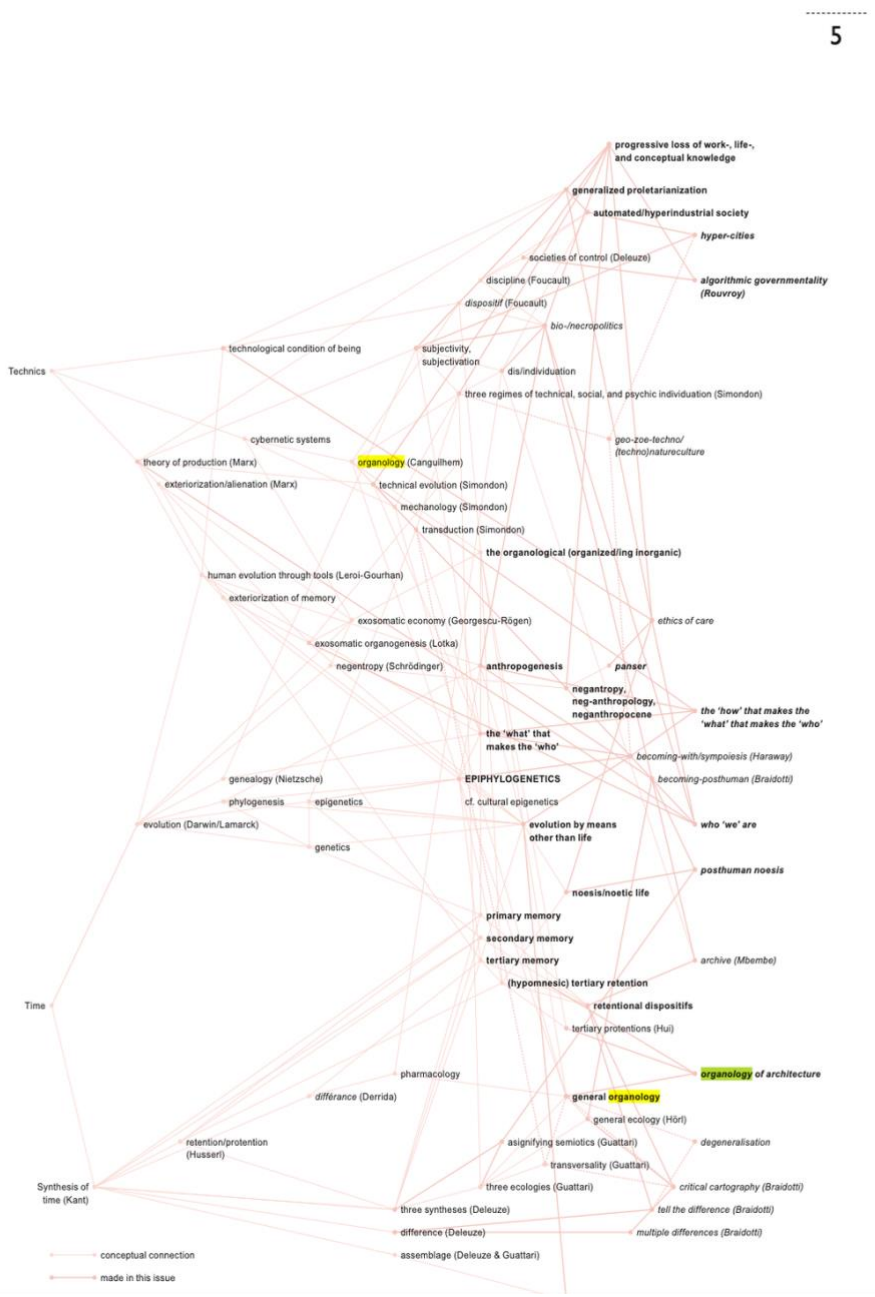



**Figure 2.** Conceptual network of key terms for theorising and technical co-evolution of socio-techno-environmental assemblages, within and beyond Stiegler's Technics and Time. Erik Lint (2025).

## 5.2 Organology and the co-evolution of dreams and technics

*"In reality, dreams generate technics, which itself generates dreams: dream and technics cannot be separated" (Stiegler, 2016). In Stiegler's parlance our oneiric (dream life) and noetic being (life of the mind) are constituted by the co-evolution of dreams and technics."* (Bradley & Kennedy, 2021. P.99)



Funded by the European Union

Bernard Stiegler has addressed the themes of the next generation and societal crisis extensively in his works. *Taking Care of Youth and the Generations (2010)* is a critical examination of how digital technologies and media shape the cognitive and social landscape of younger generations. Stiegler calls for a collective effort to rethink and reform educational practices, media policies, and cultural engagement to support the healthy development of youth in the digital age. Stiegler argues that there is a need for a new form of pedagogy that can help younger generations navigate and critically engage with the pervasive digital technologies. This work is particularly concerned with the societal responsibilities towards youth and the intergenerational transmission of knowledge and values.

In this later work, Stiegler critiques the current economic system and its unsustainable practices, proposing a new economic model that can better serve future generations. Since 2018 he focuses on the broader societal and environmental crises precipitated by the Anthropocene era, characterized by significant human impact on the Earth's geology and ecosystems. He introduces the concept of the "**Neganthropocene**," which refers to the potential for reversing the entropic effects of human activity. Stiegler emphasizes the role of new technologies and social structures in fostering sustainable development and addressing the ecological crisis. This work integrates his ideas on technology, economy, and society, and suggests pathways towards a more sustainable future for the next generations.

## 5.3 Taking Care of Youth and the Generations

Stiegler critiques the ways in which digital technologies shape attention, memory, and learning, and he proposes a new form of pedagogy to address these challenges. Key themes that can be distilled are:

### The Crisis of Attention

Contemporary digital culture creates a crisis of attention. The constant bombardment of stimuli from media and technology fragments focus and undermines the deep, sustained attention required for learning and personal development. Stiegler emphasizes that this crisis affects not only individual cognitive capacities but also societal well-being.

### The Role of Media and Technology

Stiegler critiques the media industry for exploiting attention for commercial gain. He suggests that the pervasive influence of media and technology leads to a form of symbolic misery (and a catastrophe of the sensible and the future of work in Automatic Society), where the rich cultural experiences necessary for human flourishing are replaced by superficial, consumable content. This, he argues, is particularly harmful to the youth, who are in critical stages of cognitive and emotional development.

### Education and Pedagogy

Stiegler calls for a re-evaluation of educational practices in the digital age. He proposes a new pedagogy that can harness the potential of digital technologies while mitigating their negative effects. This pedagogy would focus on cultivating critical thinking, creativity, and the ability to engage deeply with content.

### Intergenerational Responsibility

A significant theme in Stiegler's work is the responsibility of current generations to care for

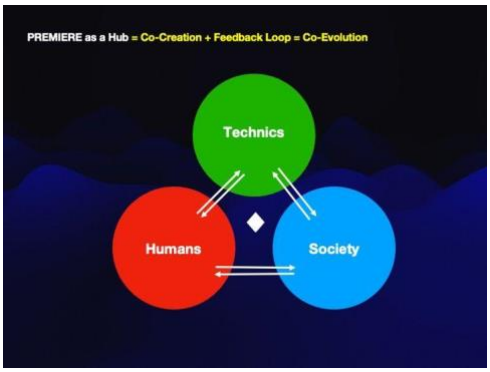


Funded by the European Union

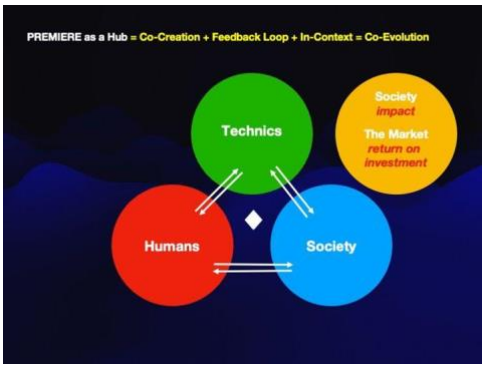
the next. He stresses the importance of transmitting cultural and intellectual heritage in a way that empowers young people to navigate and critically engage with the digital world. This involves rethinking educational and cultural policies to support the holistic development of youth.

Stiegler proposes:

1. **Reforming Education:** Developing curricula that integrate digital literacy with traditional critical thinking skills.
2. **Regulating Media:** Advocating for policies that protect youth from the exploitative practices of the media industry.
3. **Promoting Cultural Engagement:** Encouraging activities that foster deep engagement with cultural and intellectual content.
4. **Supporting Mental Health:** Addressing the mental health implications of digital overexposure through supportive community and institutional measures.

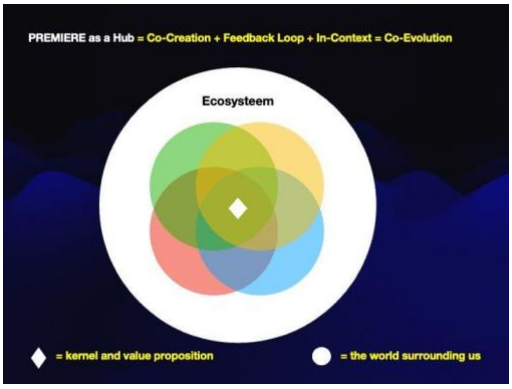



slide 1 (T)echnics, (H)umans, (S)ociety




→ slide 2 → + the (M)arket →


→ slide 3 → T+H+S+M →




slide 4 → T+H+S+M with EcoSystem

**Figure 3.** Venn circle visualisations, PREMiERE as a Hub based on Stiegler's Organology Theory. Erik Lint (2024).



Funded by
the European Union

# 6. Entangled Loops of Thinking-Making = Praxis

Research is for everyone – "everything is research"

> *"Research is not an individual activity.*
>
> *It's not something you do alone.*
>
> *It's not something you can do as if you were an individual.*
>
> *As if you were separate and independent from the relationships that creates you and that you create.*
>
> *Research is fundamentally relation: conversation, dialogue, exchange, reciprocity, listening, movement: an embedded practice of the many.*
>
> *You don't do research 'about' some 'thing'. Research happens in the middle.*
>
> *We do research with 'things' that are already doing research with and through us: with forests, with mountains, with oceans and rivers, with weather, with other beings, with the dead….with systems.*
>
> *Research is always more than one, more than one voice, more than one rhythm, more than one point of view."*
>
> — prof.dr. Laura Cull, 2023, *The Academy of Theater and Dance's research month*

In the evolving landscapes of science and art, there is a burgeoning recognition of the value of artistic methodologies in addressing complex societal challenges. This appreciation extends beyond the conventional instrumental vision of social progress, which often stems from techno-scientific advancements. Artistic innovation, in its essence, encompasses a broader spectrum of social impact, inviting us to reflect ethically on the roles and interactions of various actors within creative spaces such as motion capture studios. Here, directors, choreographers, performers, creative producers, technicians, coders connected with show control systems and capture software and hardware play integral roles. The question arises: how can we ethically reflect on these interactions if the tools are merely seen as means to an end?

## 6.1 The Role of Art Education in Technological Imaginaries

The forthcoming article"Cultural Dreams of Datafied bodies: Motion Capture as a Technological Imaginary" by Laura Karreman (2026) is organized around two questions: 'what are the motion capture imaginary's key elements? And how, potentially, might the ideas and assumptions underlying this technological imaginary be changed and/or evolve in the future? Karreman identifies "features of an imaginary that structures motion capture practices; …an imaginary that creates a critical space to consider the assumptions, intentions and fantasies underlying the datafication of human movement". The theories and practices presented (from Muybridge to Martha Graham, Merce Cunningham, William Forsythe, EG|PC, Bill T.J ones, Deborah Hay) leads to findings that 'having these data by no means provides any immediate access to knowledge about the performer's body being captured'. Indeed the PREMiERE dance use cases confirm that choreographers and 'dancers work from the inside-



Funded by the European Union

out' while the logic of capturing and storing movement as data works outward-in. Thus, it's a challenge to intermediate between inner movement knowledge of the performer and the outward-in logic of motion capture. What do these findings from professional practice in the performing arts and academia mean for the development of the creative and reflective skills that students need to develop? How to ethically relate to this acceleration of the (hidden) artificial technologies behind motion capture and its applications, while having the value of artistic practices for societal changes in mind?

Research and education at the Amsterdam University of the Arts act as a mediator for practical wisdom where theory = praxis. The AHK can therefore be seen as a public facility or even as relational object and environment (Honig 2017), because it explicitly invests in post-colonial perspectives of the next generation on humanity and democracy, especially in times of polycrisis. From this social awareness, researchers, artists, teachers and students offer context-sensitive, critical, and relational approaches based on public values such as equality, diversity, sustainability, care, generosity, and accessibility. This naturally brings with it a certain experiential arts perspective towards datafied bodies and science.

The pressing question in this context is whether truly unbiased, post-colonial technology can exist. This question is particularly pertinent given the technological disruptions experienced by artist-educators today. It necessitates a reflection on the emerging image of humanity in the Western world, especially considering geopolitical tensions and the rapid advancement of AI. Can art play a meaningful, postcolonial, and connective role through stories and imagination? What do we choose to store, enrich, and distribute, and why? Which public values guide us toward a post-Eurocentric future? Instead of posing the hegemony of European and the West against the global majority, it is important to advocate beyond oppositional geopolitical thinking so that we may create technologies which encompass a more diverse set of cosmologies and imaginaries (Hui, 2024, 2).

Engaging with augmented realities (AR), virtual realities (VR), extended realities (XR), and artificial intelligence (AI) not only compels us to consider ethics and feedback loops but also to ponder deep knowledge and its sources. What is real, what is virtual in the present day of technological imaginaries? Following Gilles Deleuze (1968); which kind of virtualities and possibilities of hybrid 3D Virtual Theatre stages are not yet actualized?

## 6.2 Auto-poiesis, Sym-poiesis & Cosmotechnical Worlding

In theatre and performance studies Erika Fischer-Lichte's concept of auto-poiesis and Donna Haraway's notion of sym-poiesis are particularly relevant in this discourse. Fischer-Lichte, in "The Transformative Power of Performance" (2008), borrows from Maturana and Varela's systems theory to describe performance as a self-generating process—a dynamic interplay between performers and spectators. This auto-poietic feedback loop continuously evolves through reciprocal influence, where the performance is not a static product but an event of co-emergence, shaped moment-by-moment through presence and response. Not only the performers but also the audience take embodied knowledge with them, so what happens before the start and after the end of the performance differs fundamentally from the performance itself. The here and now mediates between the past and an imaginary future.

In this view, agency is not hierarchical or linear but decentralized and shared. Performers and spectators co-create meaning through embodied interaction and affective resonance. Spectators are no longer passive recipients but active participants, blurring the boundaries between artist and audience and fostering transformation in both. Donna Haraway, in



Funded by
the European Union

“Staying with the Trouble” (2016), offers sym-poiesis—“making-with”—as a relational alternative to auto-poiesis. Haraway posits that nothing exists in isolation; while auto-poiesis emphasizes internal self-organization, sym-poiesis insists that no entity creates itself alone. All beings are entangled with others—human, nonhuman, ecological, and technological. Sym-poiesis is not merely a descriptive term but an ethical orientation toward response-ability, care-ful relationality, and collaborative becoming.

Haraway emphasizes dependency and attunement over autonomy, asserting that the subject is always constituted through its relations. Sym-poiesis invites us to acknowledge and nurture our interconnections across species and systems, demanding a shift in how we understand agency and responsibility. Artists, scientists, and activists are thus called to rethink technologies anew, advocating for situated knowledges and brave, generative coalitions. As Haraway (2016) notes, “Neither One nor Other, that is who we are and always have been” (p. 98).

Yuk Hui’s philosophy of cosmotechnics and planetary thinking further enriches this conversation by questioning the underlying metaphysics of technological thought. In Recursivity and Contingency (2019) and Machine and Sovereignty (2024), Hui argues that modern Western technology is rooted in a singular metaphysical tradition: the long-standing division between nature and culture, in which technology is framed either as an extension of natural law (naturalism) or as a purely human cultural construct (culturalism). Against this backdrop, Hui proposes cosmotechnics as the integration of moral, cosmic, and technical orders specific to cultural contexts. He introduces a new matrix of diversity—biodiversity, noodiversity, and technodiversity—opening a third way that refuses the reductive binaries of both culturalism and naturalism.

Through Hui’s lens, both auto-poiesis and sym-poiesis reveal implicit cosmologies. Auto-poiesis aligns with Western systems theory and self-referentiality, while sym-poiesis broadens this scope to include more-than-human kinships. Hui’s critical question becomes: what other cosmotechnical possibilities might emerge if we re-situated these models in, for instance, Daoist, Indigenous, or non-Western frameworks?

However auto-poiesis and sym-poiesis are more than just epistemological concerns—they are ontological commitments. If embedded in alternative cosmotechnics, these models might facilitate new forms of “worlding,” reshaping not only performance but the way we imagine and articulate life, ethics, and ecology across cultures. The term “worlding” was arguably first employed by Gayatri Chakravorty Spivak in 1985 who criticized the colonial narratives produced by the West of the Global South as the so-called “Third World” (p. 243-244). Building on these ideasa feminist new materialist perspective, worlding refers to “the setting up of the world”. It is the context or background in which the enmeshment of human and more-than-human agencies become legible and take on significance. Rather than a passive encounter between subject and environment, worlding is an active ontological process of becoming in which the subject is implicated (Palmer & Hunter, 2018). “Knowing subjects” and “objects of knowledge” are active in knowledge production processes. As such knowledge is never neutral but is partial and situated – socially, culturally, historically contingent (Haraway, 1988). Rather than performing what Haraway calls “the god-trick” as in “the view from above, from nowhere”, situating knowledge works to produce richer and more adequate accounts of the world (Haraway, 1988, p.195). In this sense, epistemology grounds ontological claims, worlding occurs at their intertwinement.



Funded by
the European Union

A cosmotechnical worlding implies drawing (also) from non-Western experiences, places or encounters and actively engaging with the contexts in which those encounters occur. In the context of innovation and social impact, it is important to note that art colleges in the Netherlands are not defined as academies of applied science. Labs offer more free space and time for subjective experiences, embodied knowledge, criticality, and individuation processes. Ideally, these labs are less applied in the sense of a means to an end. The Academy of Theatre and Dance in Amsterdam, for example, forms a strong neurodiverse and cross-cultural community, continuing to invest in inclusion policies. Following Édouard Glissant (1997), the academy offers a poetics of diversity and multiplicity without hierarchy, critiquing the flattening of cultural diversity. Artistic leaders of theatre and dance companies and performing art schools tend to argue against the desire for Western modes of categorization, devising new modes of confronting the neoliberalization of technology and its flattening of cultural differences. Hui proposes in "Post-Europe" (2024) a transformation that must take place through an individuation of thinking between East and West, and not through a return to tradition. We would like to add the North and South to that, where the center is just the plural perspective on worlding.

A recent essay in *De Volkskrant* (Grosfeld, 2025) succinctly captures Joseph Weizenbaum's (1923–2008) enduring concern: "If we are not careful, we face the prospect of a mechanised and soulless existence." Already in the 1960s, Weizenbaum observed how readily people projected human qualities onto nothing more than patterned text generation. As his original ELIZA paper (Weizenbaum, 1966) makes clear, the program has no understanding of the text it processes, and yet people quickly treated it as if it did. As Grosfeld notes, "When an object speaks our language, we assume it must be alive."

This reflex — the tendency to anthropomorphise and attribute liveliness to computational responses within a primarily Western epistemic lineage — is precisely what Yuk Hui draws attention to. As soon as technology is taken for granted as "intelligent", "understanding", or "caring", as if it possessed a form of consciousness, we imperceptibly slide into what Weizenbaum called a shift in the image of humanity: we begin to measure ourselves against the model of the machine, rather than the other way around.

It is therefore timely to revisit Weizenbaum not as a nostalgic dissenter from a bygone technological era, but as an early cosmotechnician: someone who recognized that technologies are never universal but always diverse and world-shaping. Only a plurality of technical imaginaries — rooted in different cosmologies, relations, and modes of attentional attunement — can sustain human becoming in an age increasingly structured by automated patterns of perception, inference, and response.

## 6.3 Cosmotechnical Organology in Performance & Technology

What does cosmotechnical worlding have to do with performance? Motion-capture based performance research – and art education more generally– can enact a kind of cosmotechnical worlding in how it rethinks human-technology relations through its auto-poietic and sym-poetic processes. The "making-with" of artistic research within an educational setting implies the remaking of the educational institution itself. Social and organizational structures are questioned and challenged by the transgressive impetus of forming new concepts and their materialization in cutting-edge artistic work. In effect the



Funded by the European Union

drive of artistic research towards articulating specific experiences and encounters leads to a reconfiguring of our perception of the world, a re-worlding induced by technologically advanced performance practice.

Art education generally pays attention to worlding through its instantiation of public values and storytelling. The pursuit of the unknown and the desire for new experiential narratives often precede output and measurable impact. It is increasingly acknowledged that both society and art education are shaped by technological structures that are far from neutral. These structures are often conditioned by specific, predominantly Western metaphysics and capitalist frameworks. This realization compels us to continuously reconsider our relationship with mediation and the tools we use for creation, research, and learning.

The notion of organology, as developed by Bernard Stiegler, Gilbert Simondon, and further explored by Yuk Hui, provides a crucial theoretical framework for understanding the relationship between humans and technology and society. Organology refers to the study of organs and their functions, extended to include technical objects as co-constitutive of human experience and subjectivity.

Stiegler's work on organology emphasizes the co-evolution of humans and technical objects. In his view, technology is not an external tool but an intrinsic part of human development. Stiegler argues that technical objects play a crucial role in the process of individuation, where humans and technologies co-constitute each other. This perspective challenges the traditional view of technology as a mere instrument, instead positioning it as a fundamental aspect of human existence and cultural evolution.

Gilbert Simondon's concept of individuation further enriches this understanding. Simondon posits that individuation is an ongoing process of becoming, where beings are continually shaped by their interactions with their environment, including technical objects. This process is not limited to humans but extends to all forms of existence, highlighting the relational and dynamic nature of being. Simondon's ideas resonate with the concepts of auto-poiesis and sym-poiesis, as they all emphasize the interconnectedness and co-constitution of entities.

Yuk Hui builds on Simondon's and Stiegler's ideas to develop his notion of cosmotechnics, which integrates technical objects into a broader cosmological framework. Hui's organology is not just about the relationship between humans and technology but also about how this relationship is embedded within specific cultural and cosmological contexts. He argues against the universalist understandings of technology, insofar that different cultures have unique ways of integrating technology into their cosmologies. Technologies are themselves invested with disparate worldviews which leads to “cosmotechnical” practices. This perspective opens up new possibilities for reimagining the role of technology in performance and art, grounded in culturally-specific and plural ontologies.

Similarly, what unites Fischer-Lichte and Haraway’s thinking is their dismantling of a fixed subjecthood detached from the environment and their emphasis on process, emergence, and entanglement. Fischer-Lichte offers an aesthetic ontology of embodied co-presence in performance situations; Haraway extends the self-organising concept of auto-poiesis to sym-poiesis, an ecological, situated and relational understanding of “making-with” grounded in care and multispecies co-creation. Hui urges us to recognize the plurality of such knowledges and to explore how different cosmotechnical traditions might guide alternative practices of making and being. Each thinker presents a generative model of worlding, how worlding comes about when particular concerns are addressed.



Funded by
the European Union

Performance becomes a space of re-worlding—where bodies, technologies, and environments are interrelated in transformative ways. Rather than isolating systems or subjects, we are invited to see ourselves as participants in recursive, situated, and collaborative loops of "becoming with" the world (Haraway, 2008). In art and life, we are always making-with—entangled in loops that are no longer ours alone. We are 'Humans are In Formation' (Smith, 2025); datafied as information and finding ourselves as continuously In Formation.

The concepts of auto-poiesis, sym-poiesis, and cosmotechnics complement an organological perspective to offer rich frameworks to understand how performance reconfigures the relationship between humans, technology, and social structures. These ideas challenge us to move beyond traditional dichotomies and embrace a more relational and dynamic understanding of being and becoming. In the context of art and performance, this means recognizing the transformative potential of entangled loops of co-creation and re-worlding, where bodies, technologies, environments AND organisations influence each other in transformative ways. As we navigate the complexities of the contemporary world, these concepts invite us to imagine and enact new forms of existence, grounded in iterative questioning, care, responsibility, and plural ontologies. This is also a plea for complex organizations to be (become) respons-able for future generations.



Funded by
the European Union

## 7. Ethico-Aesthetic considerations of *Roman & ELIZA*

— Sorcha Ní Bhraonáin

The performance research project *Roman & ELIZA*, developed by artist Ulrike Quade and IDlab-AHK as part of PREMiERE, is one such example of a co-creative and response-able process of making aimed at cosmotechnical reworlding. Taking Stiegler's Organology framework as a starting point, the team began to consider how the nexus of humans, technics and social structures can be explored through motion capture-based performance research. From artist-educators perspective new forms of theatrical storytelling are needed to express the complexities of this era and its ongoing polycrisis, prompting the desire for alternative imaginaries within which we can locate ourselves. The realm of live performance which takes place in a hybrid digital environment poses an apt setting to explore the enmeshment of virtual and physical worlds. This setting emphasises how virtual environments are not devoid of sense, materiality and physicality much like how 'real-world' environments are informed by imaginal and speculative dimensions. This intersection of conventional live performance and media-based works can be explored through performances using motion-capture systems and XR to translate a performer's movement into varying digital representations. The combined capabilities of motion capture, XR and potentialities of the AI-Toolbox (Instituto Stocos) and the 3DVT (CYENS) were explored by the AHK/IDlab R&D team in partnership with lecturer-artist-researcher Ulrike Quade and her company for a work-in-progress presentation of the performance *Roman & ELIZA*.

Ulrike Quade regularly teaches at the Academy of Theatre and Dance mostly at IDlab, the mime and scenography department. Quade is a regular collaborator at Utrecht University on research projects such as *Acting Like A Robot* (NWO) and *Dramaturgy for Devices* (NWA). The Ulrike Quade Company (UQC) is an Amsterdam-based performing arts company that makes visual object-oriented theatre through a combination of puppetry, scenography and contemporary technologies. The performances of UQC often interrogate how technological development impacts social life while speculating on the possible futures this might bring. In the search for an appropriate topic to explore through the technological arsenal of PREMiERE, the projectleader Erik Lint and his IDlab team wished to create a work that goes beyond mere demonstration of the technology's functionality or formal principles. As an established maker of visual theatre, Quade has deftly handled complex topics like abortion and multispecies relations in previous productions. As such the subject of *digital grief* was raised by the artist as part of her long-term theatrical-philosophical inquiry into the co-evolution of humans and technology. Discussions were held in March 2025 to consider what this might look like in the context of PREMiERE. The team wished to develop scenes which could extend the life-cycle of this performance in question, beyond the presentational format for Coliseu do Porto and in terms of long-term research and education ambitions. Finding the right balance between the objectives of this deliverable and the artistic-educational goals of IDlab and UQC required immense flexibility in both thinking and organisational planning. It was decided that the first scenes of what would become known as *Roman & ELIZA* would be developed on a technical and content level during the workshops at the IDlab. The theme, research approach and planning for the *AHK VR Theatre Experimentation Roman & ELIZA* has been presented to the consortium partners of PREMiERE along the way and decided upon in May at the Consortium and on-site technical meetings at Coliseu in Porto.



Funded by the European Union

During the iterative development weeks in IDlab Studio, attention would be paid to the emerging artistic research processes of this project. This included the probing of possible ethical issues which could arise upon embarking on a project of this scope. When considering the ethics of motion capture-based research, the practical ethical implications around reproductive technologies of consent, data privacy, copyright should not be discounted. However the ethical explorations of this particular VR theatre experimentation were focused on unpacking the ambiguous relation between a human and their performing digital traces explored through our application of motion capture and visualisation technologies in addition to what this raises about our subject matter, digital grief. Motion capture systems splits, multiplies and transforms the body of the performer. This logic maps onto other socio-digital dynamics in which a person's data is extracted from online activity, detached from its source and compiled to construct another digital entity, one which may 'live on' after death. Secondly, on a practical level we considered how this novel technological setup may translate into an ethical co-creative working process for all participants involved. Here, we take an ethics of care which foregrounds *response-ability* as our guiding principle.

The show itself orients 'griefbots', a form of generative AI bot built from the recycling of 'digital remains' – digital traces of deceased individuals. As such, these bots interact with the living in ways that mimic the personality and linguistic style of the dead (Stokes 2024). Griefbots are part of the rapidly expanding so-called 'digital afterlife industry' which comprises data management services that run digital memorials and store digital remains (Öhman and Floridi 2017).

The two eponymous characters of this production are based on real historical figures. Roman Mazurenko was a Belarusian tech entrepreneur who died in a tragic accident. His friend, software developer Eugenia Kudya, collected several thousands of messages written by Roman and used this data to train a Large Language Model in the form of a chatbot which could emulate Roman's way of speaking (Sisto 2021). The character of ELIZA on the other hand, is based on an archaic software created by MIT computer scientist Joseph Weizenbaum between 1964 and 1966 (Weizenbaum, 1966). It is considered the first ever chatbot and the first AI program to conduct a natural language conversation, a kind of precursor to digital assistants like Siri and Alexa. In the leadup to workshops at the IDlab, Ulrike Quade, researcher and dramaturg Maaike Bleeker and dramaturgical assistant Sorcha Ní Bhraonáin compiled preliminary research on the subject of digital grief and so-called 'grieftech'. Following this, Quade wrote several scenes which posed as a kind of scaffolding with which to create content during the development weeks at the IDlab between 19th-30th May 2025.

## 7.1 Motion-capture & Puppetry: The model of responsivity

In this piece, the digital technologies of motion capture and its implementation through the AI-Toolbox is juxtaposed with the analogue technology of puppetry. Ulrike Quade's puppet practice posed a fascinating lens with which to explore the creation of motion-capture based theatrical performance. Puppetry as a material performance practice is poised to question the predominant paradigms which guide our understanding of the relationship between human beings, enfleshed bodies and the world of matter. Considering its diverse functionality, puppetry can be understood as a technique, an artwork, a medium and a ritual practice; it gives a unique focus to objects in performance and offers a "concrete means of



Funded by
the European Union

playing with new embodiments of humanity" (Posner et al. 2014, 2). Initially considered a form of digital puppetry, motion capture similarly brings characters to life, animating them through the real-time control of three-dimensional computer renderings, thus combining the qualities of "puppetry, live action, stop motion animation, game intelligence and other forms into an entirely new medium" (deGraf and Yilmaz 1999).

Throughout the making of this VR theatre experimentation, puppetry has been understood as both a technique of the theatre – the animation of inanimate objects – and a conceptual lens with which to consider griefbots themselves in the algorithmic puppification of digital data remains. Puppet practice and object-centred approaches to theatre largely inform how we understand emerging technologies such as bots and robots, often raising parallels between the two. Insights from puppetry also provide a meaningful interpretive framework with which to understand this particular performance and the making of it. According to Laura Karreman, to develop insights from motion capture data, a situated interpretative framework is necessary. If we are to grasp what motion capture does and to render motion data meaningful, it is vital to know the specific performance knowledge being researched – how a recording took place, who performed it and which artistic concepts inform the performance (2025).

The theatrical presence of the puppet and the puppeteer raises large questions around subjectivity, agency and life in this intermingling of flesh and matter (Posner et al. 2014, 166). In alignment with new materialist principles of agency, to think from a "puppet perspective" designates how objects have power over us, not simply the converse. One of the most pervasive popular metaphors of puppetry is the omnipotent creator who animates and controls a creation made in their own image. However this understanding of puppetry as a machine to be manipulated is a distinctly Western view. Puppets are notoriously unruly and will not simply 'do as they are told.' Indeed many Asian traditions of puppetry consider puppets to impose life on their manipulator, an example of which is the Japanese tradition of Bunraku (Foley 2000, 16). In their introduction to a 2014 edited collection on puppetry and material performance, the authors note a shift in the contemporary paradigm of puppetry, from one of manipulation to one of response: "How the material (physical, phenomenological) world performs, not in the sense of how we might manipulate or dominate it, but of how we might respond to it" (Posner et al. 2014, 6). In considering how puppetry operates, this move from a Western paradigm of manipulation to one of response reverberates with an ethical approach to motion capture performance based on cosmotechnical responsivity.

In her 2007 phenomenological account of performance and technology, philosopher and dancer-scholar Suzan Kozel considers the distinction between interaction versus responsivity in relation to art created with sensor-based computational systems. The former, rooted in the liberal humanist subjectivity, entails autonomous purposive decision-making and thus negates the passive spectrum of human reactions and constructions of embodiment. Instead Kozel advocates responsivity which covers other kinds of agentic acts: "listening, prevaricating, meandering, stumbling, thinking, reassessing, and hesitating; the states of confusion, uncertainty, frivolity, intimacy." In this sense, agency is distributed across a range of bodies, materialities and human modes of being. By analysing motion-capture-based performance, Kozel seeks to construct an ethical framework out of responsivity. This responsive model implies an ethical engagement with technology located in the act of responding. Crucially, unlike interactivity, responsivity does not foreclose system failure or



Funded by
the European Union

faultiness, instead allowing for ambiguity within moments of sensory experience evinced by human-technology relations. What Kozel deems a "poetics of responsivity" offers an ethico-aesthetic approach to sensor-mediated user experiences that can be extended to the making process of sensor-mediated performance (Kozel and Eeuwens 2008, 186–88).

A working description of *Roman & ELIZA* initially used was "virtual puppetry and technologically advanced avatar creation." In the term "virtual puppetry", the puppetry lens is extended to the field of motion capture whereby a performer wears a sensor-laden bodysuit that picks up their movement, this motion data is translated into a corresponding digitally rendered avatar. The performer becomes puppeteer, the avatar becomes puppet. The controller-controlled, manipulator-manipulated dynamic is richly elaborated through Quade's puppet practice, dispelling myths that one is always in full control of their own body. This point is echoed by Susan Foster, who describes how even dancers after rigorous training and years of practice are never in full control of their own body, it can always inexplicably diverge from expectations (Foster 1997, 482).

The making of *Roman & ELIZA,* a motion capture-based performance research project developed by IDlab and Ulrike Quade Company as part of PREMiERE, is similarly charged with a poetics of responsitivity as its ethical framework. Not all of the choices and decisions that arose in this process were consciously made by human actors, much of our work entailed an open exchange of responsivity to and with the combined technical systems gathered before us. This leads to myriad ethical and aesthetic (ethico-aesthetic) considerations upon the present creative process, only some of which can be outlined here due to limitations in scope. Echoing the dictums of Asian puppet traditions, the material world performs not through how we manipulate or control it but by how we might respond to it (Posner et al. 2014, 6). In the effort to position our artistic research process as cosmotechnical sym-poiesis, this ethico-aesthetic approach requires of us to be aware of our responding to technology as and when it takes place.

## 7.2 Response-able human(-computer) interaction

Donna Haraway reminds us that "it is people who are ethical, not these nonhuman entities" (Haraway and Goodeve 2000, 133). Ethics in this sense not only encompasses our dealings with technologies but also with each other in the making processes which involve those same technologies. This responsivity model of ethics can be expanded to Haraway's neologism *response-ability* mentioned previously in this deliverable. Being both responsive and responsible implies becoming aware of one-another's needs and expectations as they arise and transform throughout the making process. It also means remaining attentive to the ways in which we encourage or prevent one another from being responsive within collaborative creative environments. It is a form of relational care ethics which accentuates interdependency, sensitivity to affect, and requires ongoing maintenance (Puig de la Bellacasa 2017, 5). According to Bleeker, a *response-able* ethics of care is not limited to what is created in the studio:

> *"It also involves a praxis of attending to how creation processes are organized, who is involved and in what role, where performances are shown, how and to whom, how performances are produced, in what context, and with whom, the setting up of working conditions and taking responsibility for their implications"* (Bleeker 2023, 2)

This ethical approach of *response-ability* therefore cuts across how participants interact with



Funded by the European Union

each other during the making process but also how they interact with the technology itself. When contemplating how the performing human self corresponds to their digital avatar, one is struck by the ambiguous connection between bodies on stage and 'bodies in code' (Hansen 2012) which may take visual or sonic form through the datafication of movement by the motion capture system. These digital media interactions trouble where the performer's body ends and a synthetic body begins. Motion capture-based performance research brims with potential to transform our understanding of human-computer interaction, particularly in its capacity to question our concepts of digital data and the self. What this requires is a non-prescriptive ethical approach which is both embodied and situated, emerging precisely from the interaction between performer and interactive system (Kozel and Eeuwens 2008, 214).

In *Roman & ELIZA*, this human-computer relationship is explored both on a conceptual and technical level through the use of motion-capture, but also on a conceptual and narrative level, through the core subject matter of the performance. This performance research centres digital grief, more specifically, the phenomenon of griefbots, generative AI bots built from the digital data of the deceased. The use of motion capture technologies (among several others) through live performance serves a novel mode of exploration into the increasingly dense and dubious ethical landscape of emerging AI technologies. Hence an ethical framework for understanding the relation between a performer and their motion capture data may potentially be mapped onto other such data-intensive practices and interactions, a feat which this performance attempts to tackle in its consideration of griefbots. As Kozel asserts, ethics is considered in practical applications of socially disruptive technologies yet rarely examined in the context of digital performance (Kozel and Eeuwens 2008, 217). This leaves ample room to unfurl the numerous ethical strata of hybrid digital performance.

### 7.3 Matter & Meaning: Speculative explorations through the VR Theatre

One route of ethical exploration to which theatre practice is particularly suited is the realm of speculative ethics. This follows the philosophical practice of speculative design fiction, newly minted within the realm of AI ethics, whereby ethical issues of emerging technologies are elaborated through the speculation of situated, real-world circumstances (Hollanek and Nowaczyk-Basińska 2024). The speculative impetus of Quade's work is echoed by the rise in speculative design as a method among some technologists who wish to re-imagine the dominant cultural scripts that structure data-driven technologies. In this sense, artistic practice is adept at expanding our cognitive horizons:

> *"Art plays a vital role in scaffolding and constituting new forms of understanding and enables critical and creative thinking beyond the constraints of one's own unaided imagination, or that of sociocultural norms and conventions in which we can become inattentively immersed"* (Anderson 2024, 31).

The speculative impetus of art allows us to think anew. Our encounter with the unexpected through artworks widens our experiential repertoire, it bypasses usual cognitive constraints and takes us beyond our experiences to the realms of other minds, places, situations and times (Anderson 2024, 31–34). On a narrative and content level, this work in progress is part of an investigation of the ethics of digital recreation services and the so-called digital afterlife. The full performance (to premiere in spring 2026) poses this hybrid-theatrical setting as a thought experiment on the development of 'grief-tech', technologies which socially disrupt



Funded by the European Union

our experience of death and grieving. The performance asks what it means to create a new digital rendering of a deceased person? Theatre becomes an avenue to test the limits of public acceptability and how far we are prepared to venture on this journey of supposed digital immortalisation.

The technologies that we use in this performance become the means through which we explore these questions, by breaking the virtual world into several elements; through motion-capture, visual animation, virtual scenegraphy/stages and voice recordings, we carve up the digital body into its respective parts.

> *"it exists, it is not exactly the same as me, but it is also not irrevocably different from me, and, in a broader sense, we cannot pretend that the digitization of our bodies and social relations is going to evaporate or even diminish. Like it or not, we have digital twins"* (Kozel and Eeuwens 2008, 250).

Karreman describes how motion capture-based research in the performing arts subverts the conventional tool-based understandings of this technology within large industrial settings such as game, medical, film and military applications. Instead performance research tends to focus on making sense of the moving body in performance by zoning in on movement qualities, embodied knowledge, technique and training. This combination of technical and performance expertise considers motion-capture as an actor in the creative process (Karreman 2025).

From the perspective of Quade's practice, mocap becomes one source of inspiration with which to build a visual world. As such, the team of this project, and AHK as an educational institution more widely, is not simply interested in how motion-capture operates but in how it creates meaning and generates fundamental questions about human-technology relations. Our concern is not about doubling or replacing the performer with the digital entity, rather we are interested in what transformations can occur through the digitally-mediated exchanges with motion capture systems. Ethics resides in how one affectively responds to the digital counterpoint, thus giving meaning to the exchange. The performance of *Roman & ELIZA* is an attempt to make tangible the permeability between bodies both in their physical material form and as digital abstraction. Here we can consider insights from Deleuze on the enmeshment of matter and meaning: "what we call virtual is not something that lacks reality but something that is engaged in a process of actualization following the plane that gives it its particular reality" (Deleuze 2001, 31). This actualization of virtualities is precisely what theatre strives to accomplish, materialising the imagined and re-imagining the material.

## 7.4 Scenographic composition & technological setup

In terms of working processes, IDlab acts as a hybrid learning environment for concept development of final projects or research projects by students and teachers. In a similar vein, Quade typically does not work with a script in the first stage of development for a performance. Once a concept and preliminary research for the show has been produced, Quade prefers to build a montage of images using theatrical means which come to eventually reveal their own logic. Known as visual dramaturgy, this approach is common to puppet-theatre whereby the starting point for creating performance relies on systems of nonverbal, visceral communication generated by its design with the material world (Bass 2014).



Funded by the European Union

For *Roman & ELIZA* however, the creative process proceeded differently given the sheer amount of advanced technologies being used, some of which have only recently been developed for PREMiERE and which Quade had never worked with before. In order to make digital content for the production a basic script was required around which images could be created. With plans to include a writer in later phases of the project once clearer images of the show had been constructed, Quade wrote three scenes using prompts from ChatGPT. These sketches functioned as a sort of skeleton through which the new technologies could be experimented with.

The first scene features the character of Roman driving a car and texting his friends while doing so. On stage is actor Vanja Rukavina with a physical screen behind him (figure 11 and figure C1 – Appendix C). The car crashes and Roman is thrust into a new environment where pixelated words and images of himself flash on the screen behind him. In the following scene the figure of ELIZA appears. The actor who voices ELIZA, Hadewych Minis, is not present on stage. ELIZA on stage is instead played by Anne van Dorp in a mocap suit. When the camera pans out, we see on screen a virtual construction of the theatre Coliseu do Porto. A triangle of virtual screens appears on the stage of the virtual theatre with the face of ELIZA stretched across it. Here we see an AI-powered face mask projected across the virtual screen using Facecap and 'inorama', a technology developed by our technical lead Keez Duyves which inverts the panorama lens using a visualiser of 200 virtual cameras to give a 360 degree angle from inside (figure C2, Appendix C).

Roman speaks to ELIZA while his new bodily form is slowly constructed. Rukavina wears an Xsens suit which detects his movement and converts it into motion data. On the screen behind him, we see Rukavina's digital avatar being built from particles to a wire frame to a fully fleshed character (figure 14). To create a more hybrid cinematic performance for the audience, Duyves films this scene live using a virtual camera – a headless Vive system connected to four infrared lighthouses positioned around the stage. Roman discovers how his new body operates in this liminal cyber-realm, his movements trigger sounds using the motion sonification tool from the AI-Toolbox. The final scene features Charly, one of Roman's friends, who attempts to chat to griefbot-Roman. This interaction is interrupted by a system message stating that a subscription upgrade of the grieftech platform is required to continue conversing with Roman (figure C3 – Appendix C).

The scenography of the performance became an important way to imagine how this cyber-realm looks and feels like. Initially, it was conceived to feature several semi-transparent screens hanging on the physical stage upon which a virtual scan of the Coliseu do Porto would be projected (figure C4 – Appendix C). However these layered physical screens were later abandoned for one physical screen onto which the virtual theatre is projected. This 3D virtual theatre is one of the technologies developed by CYENS for PREMiERE. It can contain 3D scans of theatres as a backdrop for virtual performances and was ideated as a virtual reality streaming platform for the transmission of live XR events. During the creation process, the team chose to build a digital twin in a virtual replica of Coliseu Do Porto which unfolds before the viewer's eyes. In doing so, the team discovered the technical complexity and some limitations of the 3DVT for this form of augmented liveness. Technical and production aspects were also taken into account in the pre-agreed stage-on-stage setup with ICK during the closing event at the Coliseu Theater. Hence the technical team opted to create their own version using the game engine Unreal which mimics the functionality of the original.

Adapting the principles and functioning of the 3DVT led to efficient creative use and an



Funded by
the European Union

augmented sense of liveness. The construction of an imaginary world with actors and multiple technical virtualities unfolds itself in the performative here and now. Like the original 3DVT, in our virtual theatre, the performers and spatial design can be represented digitally through human avatars, animation and 3D scene modelling. An added benefit of this locally created environment is the possibility to include virtual screens which became a key component of our scenography. Through NDI and Resolume, images of ELIZA are broadcasted over the network to the virtual screens (figure 4). These images of ELIZA were rendered in Unity. As demonstrated in figure 6, Rukavina is represented in the virtual theatre as a digital avatar, this was accomplished by capturing the motion data of his bodily joints via the Xsens suit, this data is then used to synthesise the real-time movement of his digital avatar which is placed within the virtual theatre. This complex scenographic composition combines physical and virtual stages with physical and virtual screens; a live actor and his digital avatar, plus a person who films the virtual world. A live audience witnesses how this digital world is constructed and unfolds in real time.

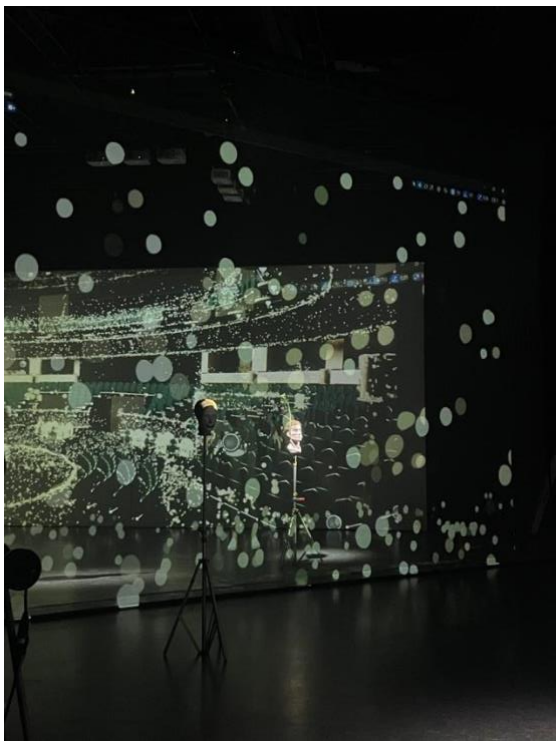


**Figure 4.** Initial scenographic design of Roman & ELIZA by Ulrike Quade Company @ IDLab, March 2025. Photo: Sorcha Ní Bhraonáin



Funded by the European Union

**Figure 5.** Actor Vanja Rukavina with backdrop of 3D scan of virtual theatre. @ IDlab Studio, March 2025. Photo: Sorcha Ní Bhraonáin.

**Figure 6:** Rehearsal image of Roman & ELIZA. Ulrike Quade Company @ IDlab, September 2025. Photo: Sorcha Ní Bhraonáin.



Funded by the European Union

## 7.5 AI-Toolbox and the Aesthetics of Transparency

Key components of the visual dramaturgy of *Roman & ELIZA* were advanced technological tools such as motion capture and the motion sonification tool of the AI-Toolbox. The motion sonification tool was tested primarily in the first scene where Roman is driving a car, the aim of which was to find a way for Rukavina to control the sound of the car with his own movement. The motion data from the Xsens suit is sent to Open Sound Control (OSC), a communication protocol for networking sound, media synthesisers and computers during realtime musical performance (figure C4 - Appendix C). Rukavina's movement is abstracted and computed as low-level kinematic data that is structured according to the dance notation system of LaBan Movement Analysis. This system describes movement principles that relate to the dynamics, energies and inner intention of movement, all of which contribute to the expressivity of movement. This motion data serves as the basis for several creative applications of the AI-Toolbox, one of which is sonification, whereby motion data is translated into audio through a recurrent neural network. Sound composer Farzeneh Nouri set parameters for particular movements in space which were then mapped onto specific sounds, these sounds were then implemented in the Supercollider audio programming environment.

Setting these body parameters and mapping them to sound proved to be quite challenging. The Xsens suit only picks up the movement of seventeen joints through seventeen different sensors even though there are twenty-four joints in a human body. Since the body has so many dimensions and rotations, it would be unfeasible to connect every bodily joint to a specific sound. Additionally, if each part of the body maps onto a specific sound, it's very difficult to make movements specific enough for the motion data to differentiate between these sounds. As part of the testing phase, the technical team decided to set a parameter that picks up the movement of the top of the right foot pressing down as if pressing on a gas pedal. This movement was mapped onto a sound that resembles a car accelerating. They also set a parameter that picks up the spatial coordinates of the performer's two elbows when they move as if steering a car, this was mapped onto a sound that resembles a car swerving.

Although it was useful to test the technology in this way, the team agreed that these movements were too pantomime. A pantomime is a kind of non-verbal iconic gesture that depicts a particular physical object or action. So, in this example, to signify driving a car, Rukavina mimes with his hands the movement of turning a steering wheel. Artistically and technically this scene became interesting to the team because it raised the question: how can we make it explicit that the performer is controlling sound with his own movements without falling into pantomime territory? How to disclose this sonification function of the AI-Toolbox while keeping the scene artistically intriguing? The question of who is controlling who – does Roman puppeteer his own griefbot or vice-versa? – is a key concern for the show. It was important to Quade that Roman the character and Rukavina the actor were both positioned as a kind of puppeteer with the sonification tool providing a novel way to explore this idea. Even though this composition worked on a technical level, given that the movement could be accurately mapped to sound, in terms of the visual dramaturgy it felt too literal and figurative. What we see and what we hear on stage are the same, we have cancelled any potential tension derived from these dramatic elements and the image leads nowhere, instead creating mere illustration. This is one of the challenges we faced when attempting to align the functionality of the technology with certain aesthetic choices.



Funded by
the European Union

Similarly Scott deLahunta bemoans the transparency issue in performance-making with interactive systems regarding the receptivity of the audience to certain aspects of the work. Not only is it important to explicate to the audience this relation between input and output of these technologies, a next step would be to make the mapping itself between input and output tangible to the audience. Within this interactive system, movement from the Xsens suit generates motion data which provides information about the velocity and location of the moving body parts. This information is translated through OSC to become input data to the AI-Toolbox where various sound parameters can be set as output. The connection between a performer's action that activates data streams which cause the sonified output event is determined by mapping. Mapping is the very correspondence between control parameters and sound (or visual) synthesis parameters (deLahunta 2016). Yet this mapping, an integral part of the making process, remains 'invisible' for the audience. A visual diagram of the networked communication set-up for the AHK-VR experimentation of Roman & ELIZA is documented in Appendix C — Technical Architectures and Prototypes, Figure C4.

This raises both an ethical and aesthetic question for the future of motion capture-based research in the performing arts. Increasingly, there is a desire among contemporary audiences for the making of the artwork to be incorporated into the performance on stage. This can be attributed to the phenomenon known as postdramatic theatre. Postdramatic staging devices often 'retheatricalise' events on stage to expose the construction of the reality from theatrical means, typically by denaturalising what is on stage and making it theatrical (Bleeker 2008, 3). This approach disrupts any internal unity or coherence of the performance, blurring the boundaries between the world on and offstage, between fictional narrative and the mechanisms through which this is performed (Bleeker 2023, 38).

In their appraisal of the artwork, the audience may imagine its composition and become aware of the sense-making process of this imaginative act. Given the post-dramatic sensibilities of contemporary performance practice which seek to expose the 'construction' of realities on stage, how might the full spectrum of the making process be made tangible to the audience? How can a performance give the audience an understanding of input, mapping and output of these systems? Dance performances using interactive systems tend to allow the audience to only see output whereas interactive installations often make experienceable both input and output (deLahunta 2016). Could postdramatic theatre with its emphasis on exposing the constructive layers of performance present all three to the audience? Not only would this deal with the 'transparency' issue of interactive systems, but it could also offer an ethico-aesthetic entrypoint to the subject-matter of the performance whereby the constructive capacities of the theatre are utilised to highlight the construction of other types of socio-technical realities.

## 7.6 Of Glitches & Protocols – A postdramatic ethico-aesthetics

A potential avenue towards a *situated* ethico-aesthetic framework for motion capture-based performance research may be found in the very workings of this complex technological setup, namely its inevitable propensity for glitches, lags and crashes. Needless to say, these technologies are inherently unstable, as we encountered countless times throughout the rehearsal process. Due to slippings of the suit or poor calibration, the previously established indexical relation between the sensor attached to the performer's body and the data captured suddenly disappeared causing the motion data – visualised in the form of the digital avatar – to decouple from the movements of the performer. This happened frequently



Funded by
the European Union

during our runs, including the presentation performance at the Coliseu. A mis-calibration of the system meant the performer couldn't find his mark to activate a certain visual effect, leaving the body of the digital avatar headless.

Unlike some performance practices, these glitches cannot be erased post-production during a live mocap performance, instead they become a veritable part of the performance in process (Karreman 2026). Although the overall aim of this work in progress was ostensibly to get the technologies to work as intended, technical malfunction was unavoidable when performing in such a complicated technical setup. Therefore a particular ethico-aesthetic perspective around these technical hiccups was required so as to continue the creative process rather than halting it. As such these kinds of glitches, although unplanned and disruptive, became a rich source of artistic and conceptual potential for the project. Quade decided early on to openly work technical malfunctions into the performance rather than suspending everything until they were resolved. The dramaturgical choice to make the workings of these crashes tangible to the audience draws from the ethico-aesthetic tradition of postdramatic theatre which foregrounds a kind of performative transparency. Rather than denying the incursion of glitches, Quade chose instead to highlight them as they occurred to empower the performance in the process. Glitches are incorporated into the becoming-performance and thus are presented to the audience as an affirmation of possibility rather than a suspension of it (Braidotti 2013). The spectator is made aware of the fundamental role these technologies play in constructing the world of the performance in tandem with their subsequent fallibility, thereby affirming a situated, relational ethico-aesthetic approach to these technologies.

This led the team to the development of a loose protocol for when crashes inevitably happen. We ran through the key issues which might arise across the differing technical systems and problematised how these situations might be incorporated into the performative space. It was agreed that when technical issues occur, the team would begin to perform the resolution of these issues, communicating both with each other and the audience how they planned to go about it. At these moments, the screen would automatically revert to a screensaver which announces to the audience that a crash is occurring, both on a narrative and technical level (figure C5 – Appendix C). Specific lights and sound would also signify to the audience what is happening, a spotlight shines on the technical team as they go about resolving the issues while informing the audience of their operations. Throughout the rehearsal period, the team considered the performative potentials of these malfunctions, particularly what new ideas these moments could offer the technologies or the performance itself. When working with complex interactive systems, there is often a need for glitches to become an aesthetic point of interest, not simply for the technical team but also for the audience. Otherwise too much time is spent trying to get the technology to work while ignoring what this 'not-working' can do for the performance; what it might evoke about our ethical relations to technologies both on and off stage.

## 7.7 Emergent co-creation: An ethics of response-ability

Ulrike Quade characterises her way of working as very process-oriented and co-creative, often about composing visual materials in a montage and seeing how they make sense. "In such process-oriented methods, structures emerge while working instead of being known from the beginning" (Bleeker 2023, 46). This implies "the invention of structures on the go" coupled



Funded by the European Union

with the “capacity to recognize potentials for creating or subverting them on the basis of the materials one is working with” (Bleeker 2023, 46). However process-oriented co-creative ways of working can be complicated in their own way. Working with several advanced technologies within an organisational context across several stakeholders will necessarily effect the way in which a maker’s creative vision might emerge. This might be in a positive sense where the constraints of the technologies inspire new content but it can also be stultifying.

During these workshops, Quade wished to get a sense of what was possible to do with these technologies as a means to create images. Rather than preselecting certain images to develop, Quade creates images by arranging different audio-visual objects on stage and attending to the dramaturgical logic which emerges; what this evokes with respect to prior research on digital grief or in terms of new narrative, performative or conceptual ideas. Experimenting with new technologies in this way requires retaining an openness to their creative capabilities and boosts the likelihood of surprising and unexpected encounters. Yet this meant that when co-creating content, it was difficult for different parts of the technical team to work in tandem and often required one faction to wait forthe other to finish before the rest of the team could respond. As a result, this emergent montage approach to theatre-making applied to a technologically dense setup can lead to a slow pace of progress, especially considering how prone these technologies are to faltering. For future performance-making processes, it would be more creatively generative if technologies like the AI toolbox and the 3D virtual theatre could also include low-maintenance components that can quickly process the artists’ ideas as input. That way the team could co-create images in a more fluid way rather than stopping and starting according totechnologies which tend to be temperamental.

For performers working with interactive systems, getting the technology to function disproportionately outweighs the amount of work done in the studio or in rehearsals. The system often needs to be recalibrated several times throughout the rehearsal period. This, among other technical issues, meant thatprimacy was often afforded to the technologies. As a result, this process can be alienating experience for mocap performers who are often still required to be on stage for positioning and re-calibration but prevented from carrying out more exploratory, creative activities.

Rukavina admitted to finding these long periods of waiting to be extremely draining on his creative energies. He describes feeling ‘like a tool’ and always ‘on standby’ as he might be needed at any moment. For meaningful human-machine interaction to emerge, it is essential to explore machines as collaborators rather than instruments in creation. In saying this, attention must also be paid to the inverse – that human collaborators do not themselves become instrumentalised during experimental phases of the making process, capitulating to the machine and dispensing with their own creative autonomy as a result. A *response-able* approach to making art with technologies requires a co-creative relationship founded on reciprocity and not one-sidedness.

To avoid these same issues, it is recommended that (whenever possible) rehearsals be organised in such a way that technical fixes are divided from the more exploratory creative work with performers involved. Another solution would be to record the motion data and utilise this recording to fix any technical issues rather than require the performer to remain present for the whole period. It was also discussed that the option to separate out rehearsals with each of the technical components would be beneficial to the performers before they



Funded by
the European Union

practice controlling several moving parts at once. It might also be helpful for the actor to rehearse while wearing a VR headset so they may experience themselves performing in the virtual space and more easily locate themselves in it.

The performers played a dual role of puppet and puppeteer not just narratively but also throughout the making process. Both of these roles come with their own unique challenges. It is therefore important for the entire team to be aware of the vulnerability inherent to the complex set of demands on a performer in such a setting. Turning back to Bleeker, a response-able ethical approach means retaining an awareness of the working conditions of each participant of the creative process. Although technologies require consistently unexpected fixes, it is the duty of the technical and creative teams to plan when collective work is necessary and what tasks can be fulfilled during designated breakout moments so as to maximise the creative potential of rehearsal and development time together. This basic organisational tenet of collective performance-making is important to reiterate so as to avoid giving primacy to technologies over human actors within this novel performance ecosystem.



Funded by
the European Union

# 8. Immersion and Pedagogy

Immersive technologies are not merely tools within educational settings; they transform how learning is organised, sensed and valued. Across the previous chapters, PREMiERE has shown that technological imaginaries shape not only artistic innovation but also institutional cultures and pedagogical priorities. This chapter therefore examines how immersion operates at three interlinked scales: macro, meso and micro, each contributing to an ecology of learning in which attention, relationality and world-making become central practices. These levels do not function in isolation but in continuous feedback loops that shape one another (Oosterling, 2016–2020).

In educational contexts, such recursive dynamics directly influence a student's positionality and their relationship to the milieu in which they are situated. Here, we narrow our focus to the specific affordances of the PREMiERE technologies in relation to the performing arts, guided by the organological and attentional perspectives developed by Bernard Stiegler.

Immersion and pedagogy (learning, making, sharing, prioritising process, and approaching creative practice as research) are widely recurring principles in laboratories across universities and art academies. At the same time, significant differences exist across EU institutions in terms of time, space, and available resources, including funding and the capacity for sustained experimentation. Understanding these variations is essential, as they shape how immersive technologies can be meaningfully embedded within educational practice.

## 8.1 IDlab and Immersive Art Space ZhdK

The Interdisciplinary Lab (IDlab) at the Amsterdam University of the Arts and the Immersive Arts Space (IASpace) at ZHdK offer two distinct yet complementary models of immersive laboratories. Both operate as world-making environments: spaces where experimentation, interdisciplinarity and collective discovery are not exceptions but everyday practice.

IDlab, modest in scale yet rich in openness, nurtures a hands-on culture of curiosity and improvisation. With its cross-departmental collaborations and porous boundaries between students, teachers and external partners, the lab embodies an ethos of learning-through-making that aligns with PREMiERE's emphasis on praxis (see Chapter 6). Its strength lies in its accessibility and its refusal to separate technical exploration from artistic intuition. The lab allows students to move fluidly between sensing, creating, performing and reflecting: a regenerative cycle where practice continuously informs research and vice versa.

The Immersive Arts Space (IASpace) is a university-wide art/tech lab that serves as a research, teaching and production platform. With innovative and multidisciplinary projects, the team at the IASpace is conducting a technologically-supported artistic examination of digital immersion, mixed realities and the convergence of media-based and performative practices.

The IASpace team conducts practice-based research on the field of interaction between art, design and digital technology. The team members have their professional roots in film, game design, interaction design, music, computer science and engineering and members often have a background in more than one discipline. The IASpace is part of the research cluster of the Digitalization Initiative of the Zurich Higher Education Institutions. It exemplifies



Funded by the European Union

immersion as infrastructural commitment: a recognition that technological literacy today requires not only equipment but institutional alignment, expertise and shared responsibility.

Together, IDlab and IASpace illustrate that immersive environments become pedagogically meaningful when they cultivate relational intelligence — when they enable students and team members to navigate the entanglement of bodies, tools and social worlds with attention and care.

### 8.2 Experiencing Data – Discovering Space: Immersive Arts for Learning

Chris Salter, Artist and Research Professor for Immersive Arts and Director of the IASpace at the Zurich University of the Arts (ZHdK), has written three influential monographs, all published by MIT: *Entangled: Technology and the Transformation of Performance* (2010), *Alien Agency: Experimental Encounters with Art in the Making* (2015), and *Sensing Machines: How Sensors Shape Our Everyday Life* (2022).

In *Sensing Machines*, Salter describes the emergence of the "sensed self," examining how sensor technologies have been deployed in music and gaming, programmable and immersive art environments, driving, and even eating, with e-tongues and e-noses that taste and smell on our behalf. Sensing technologies, he argues, convert experience into data. Yet Salter's narrative is not solely about what these machines demand from us, but also what we seek from them: new sensations, the thrill of the uncanny, and the promise of transformative or transporting experience.

This captures precisely the anticipatory motivations of many artists and technologists, as well as students preparing to enter these fields, who are driven by the desire to invent, explore and encounter the unknown through proofs of concept, prototypes and immersive real-time experiences. In contrast to the two-dimensional, linear perspective of a spectator observing a painting or photograph, the immersive perspective enables the viewer to perceive from within the image (Vanhoutte & Wynants, 2010, p. 47). For Salter, immersion is not primarily about the surrounding environment or the visual apparatus typically associated with immersive art (panoramas, cinema or VR). Instead, it concerns a perceptual shift: the moment in which distinctions between body and environment, or self and non-self, begin to dissolve.

Salter also situates immersion within broader technological and historical developments. He notes that immersive forms emerged alongside the technological transformations of the late nineteenth century: first panoramas, then film as the dominant art form, and today computation in its many derivatives. Each technological episteme, as Bakk and Makai (2025) argue, produces its own modes of sensing and understanding.

In *Experiencing Data – Discovering Space: Immersive Arts for Learning* (2024), Salter writes:

> "The question of anticipators in the arts and, in particular, the context of pedagogy today cannot be discussed without reference to the radical socio-cultural changes brought about by digitisation and the emergence of new technologies such as machine 'intelligence', extended reality (XR) and the metaverse, as well as forthcoming fields such as quantum computing."

Like Michael Century, Professor in the Arts Department at Rensselaer Polytechnic Institute (RPI) in Troy, New York, Salter holds a deep admiration for Marshall McLuhan, whose foundational notion that "the medium is the message" continues to shape understandings



Funded by the European Union

of how media technologies configure perception and social structures. In his *Pathways to Innovation in Digital Culture* report for the Rockefeller Foundation, Century introduced the concept of the "studio laboratory": a class of innovative institutions in which new media technologies are designed and developed in co-evolution with their creative application. Such studio-laboratories, he argues, must be understood as emergent formations that flow between artistic, techno-scientific, economic, and discursive sources (Century, 1999–2013).

This co-evolution is central to Stiegler's organology, which emphasises adoption rather than mere adaptation, and can be read as both an aesthetic and an ethical stance. Century likewise suggests that intermediary zones should remain open to the logic of "both-and" rather than the categorical closures of "either-or," allowing us to make sense of the multiplicity of today's creative practices and institutional forms. Drawing on shared cultural values, he coins the term "alternative technological ethos" to describe a way of engaging with technology as a malleable material, open to continual revision by artists and subject to both conceptual and functional reinvention. Century identifies within this ethos a sense of "Afterness" (after Gerhard Richter): a historical continuity extending into the present while projecting towards futures shaped by creative practices grounded in sensorial immediacy, embodied interaction and improvisational expression.

## 8.3 Alternative technological ethos - Afterness and the world exhibitions 1958-2025

Michael Century's *Northern Sparks: Innovation, Technology Policy, and the Arts in Canada from Expo 67 to the Internet Age* (2022) offers a series of detailed cross-media case studies illustrating the cross-fertilisation of art, technology and policy. These cases span animation, music, sound art and acoustic ecology, cybernetic cinema, interactive installation art, virtual reality, telecommunications art, software applications and the emerging meta-discipline of human–computer interaction. According to Century, this Canadian "alternative technological ethos" has continued to function as a creative method and interdisciplinary model into the present day. In coining the term, Century refers to Jeanne Randolph's *Influencing Machines: The Relationship Between Art and Technology* (Toronto: YYZ, 1984), who introduced the notion of a technological ethos decades earlier.

There are noteworthy parallels between Canada and the Netherlands regarding icons of immersiveness at world exhibitions and the ways in which these icons persist and are periodically remediated through archival material. The Philips Pavilion, a modernist architectural landmark at the 1958 Brussels World's Fair (Expo 58), was conceived to showcase a multimedia spectacle celebrating post-war technological progress. Comparable moments emerge at Expo 67 in Montreal, with the USA Pavilion designed by Buckminster Fuller, featuring a geodesic dome traversed by a minirail and later transformed into the Montreal Biosphere. The Canadian Pavilion presented an inverted pyramid structure and a walk-through installation known as the "People Tree". Expo 70 in Osaka featured film-based innovations in the Canadian Pavilion and the Dutch Pavilion *Orandakan*, widely regarded as one of the most compelling immersive multimedia environments of its time. *Orandakan* has been reconstructed by students and presented as an immersive installation, re-imagined at IDlab as **Re-Mediate Orandakan EXPO 1970–2020**, in collaboration with Eye Filmmuseum, Sound and Vision and Het Nieuwe Instituut.

As discussed in Section 3.2, archival resurgence, combined with system-based remediation, extends afterness to audiences and spectators. It generates new forms of liveness, bringing together temporalities, spatialities and socialities into a shared present charged with



Funded by the European Union

experience, anticipation, longing and memory (Hammelburg, 2021). This can further develop into an "eventsphere" (Volkmer & Deffner, 2010): a complex distributed situation in which live audiences in the theatre hall and remote spectators — in VR headsets, on mobile phones or via pixel-streamed web environments — co-inhabit derivative yet interconnected experiences.

If we are to return to an ethos of attention, care and joy for younger generations, the interplay between physics, mathematical logic, computational logic and embodied knowledge could be allowed to flow back into primary and secondary education. This requires the involvement of alumni and artist-educators, enabling children to learn through movement, intuition and play. *Maths Dance* offers a compelling example of such practice:

> "Maths Dance has been a huge success in our school. It is a creative way of working with numbers, and it has brought joy and excitement to the subject for all. I couldn't recommend it more highly."

— Mrs Gemma Thomson, Eaton Square School, Pre-Prep Headmistress.
(Figure D1, Appendix D)

These reflections return us to the question of end-users and target groups: for whom, why, when, with what and in what ways do we aim to create meaningful societal impact?

## 8.4 The HOW - The desire for hope and an entrance to the future.

If immersive technologies are to enrich education rather than simply extend its technical capacities, the question of *how* they shape learning must be treated as an ethical and relational challenge. Hope, understood not as optimism but as a method — a stance of anticipatory imagination — becomes essential in navigating these emerging conditions. This chapter has shown that immersive environments reshape the conditions under which students perceive, relate, and act. They invite learners into ongoing processes of attention, response-ability and co-creation. In this sense, the future is not approached as a distant horizon but enacted through the everyday practices of world-making that immersive pedagogy enables.

At the macro level, educational institutions must recognise that immersion represents more than an infrastructural investment. It signals a cultural shift in how learning environments are conceived: as laboratories of entanglement where technical, artistic and social imaginaries intersect. IDlab and the Immersive Arts Space at ZHdK demonstrate how different ecosystems cultivate distinct possibilities for experimentation, interdisciplinarity and responsible innovation. Their practices reveal that immersion becomes pedagogically meaningful when it is anchored in shared values, not merely in technology.

At the meso level, immersive pedagogy aligns with regenerative educational principles. It requires cyclical processes of feedback, feedforward and reflection in which students learn to situate decisions, actions and interpretations within broader technological, ecological and cultural contexts. Through immersive arts, learners discover that their actions, gestures, movements, interactions, calibrations, contribute to a wider ecology of relations. This perspective echoes Stiegler's organological view: human, technical and social organs co-evolve, shaping and reshaping the conditions of learning.

At the micro level, hope emerges as a practical competency. Immersive environments call for attentional discipline: the ability to stay with uncertainty, to navigate hybrid spaces of presence, mediation and interpretation, and to work with both the fragility and creativity that



Funded by
the European Union

digital entanglement produces. Students learn to hold open the space between technical precision and intuitive improvisation, between data abstraction and embodied experience. This attentional attunement forms the basis of response-ability: the capacity to respond with consideration, imagination and care.

Taken together, these levels form a pedagogical ecology in which the "HOW" of immersive learning becomes inseparable from the "WHAT FOR". Immersive technologies are not introduced to accelerate production or reinforce existing pathways, but to cultivate ways of thinking and acting that sustain relational, ethical and technodiverse futures. The desire for hope is therefore not abstract: it translates into concrete practices that enable students and educators to inhabit complexity without paralysis, to imagine alternatives without escapism, and to act within uncertainty with responsibility and creativity.

This expanded understanding of immersive pedagogy leads directly to the concerns of the concluding chapter. Chapter 9 reflects on what these insights mean for the broader PREMiERE project and, more importantly, for the evolving fields of XR, AI and motion-capture-based research. It examines how ethical frameworks grounded in attention, organology and world-making can guide future technological development, institutional strategy and artistic practice. In doing so, the conclusion gathers the threads of this deliverable into a coherent proposition: that the future of XR is not defined by the sophistication of its tools but by the quality of the relations it enables, the temporalities it fosters and the forms of responsibility it demands.



Funded by
the European Union

## 9. Conclusion

In an epoch defined by acceleration, hybridity and shifting human–technology relations, this deliverable situates itself as both a reflection and a proposition. It reflects on where we find ourselves — ethically, artistically, socially — and proposes how we might move forward with intention. From the beginning, the text argues that technology is not a neutral collection of tools but an affective, political and historical force that co-shapes how we think, move, imagine and relate to one-another and to the world. We co-create our technical environments even as they remake us, and the non-linear structure of this document mirrors the non-linearity of that entanglement.

The first orientation offered is that of **ethical time**. In a world where traditional moral frameworks are no longer stable, students, artist-educators and performing arts professionals navigate an atmosphere of hyper-sensitivity, fragmentation and digital saturation. Through the lenses of responsibility, awareness and vulnerability, the prologue proposes that our ethical bearings emerge not through fixed doctrines but through relational attunement — moments of slowing down, recognising the sedimented layers of memory, and meeting the Other with care. Virilio's acceleration, Richter's afterness and Stiegler's call for delay and reflexivity due to the threat of real-time sensationalism, all converge here: a call to inhabit time differently in the face of technological compression.

Out of this temporal framing grows a second orientation: **hope**. Not as optimism, but as a method — what Bloch calls the anticipatory "Not-Yet-Conscious," and what Marinić names a joyful radicality (2024). Chapter 3 suggests that artistic–technical research becomes meaningful precisely when it refuses resignation. Hope is treated not as a sentiment but as an active stance: the courage to imagine and prototype futures even in the midst of ongoing poly-crisis. The work of PREMiERE is therefore informed by democratic values of human dignity and European frameworks for trustworthy AI, insisting that innovation must remain accessible, responsible and grounded in public life.

Hope, however, must be situated, and Chapter 3 provides that grounding through an act of **positionality**. Mapping becomes both personal and political: an acknowledgement that journalism, healthcare, education, democracy and the arts are being reshaped by data infrastructures that affect real bodies and lived experiences. Inequality, ownership and digital capitalism are not abstract problems; they structure who gets to participate in cultural and technological life. The chapter places PREMiERE within the ecosystem of digital humanism and treats collaboration between artistic practice and computer science not only as a challenge but as a generative tension. Embodied intuition meets computational structure, and this meeting becomes a fertile ground for co-creation. Regenerative education emerges as the pedagogical expression of this mapping — an ecological practice where learning is reciprocal, situated and responsive to its milieu.

From positionality, we return to the body. Chapter 4 insists that the body cannot be reduced to a discreet set of "motion units." Motion capture may translate movement into data, but embodiment exceeds datafication. The body is imaginative, entrained and enfleshed; it thinks, senses and knows through action within the material world. By weaving together phenomenology, 4E cognition, neuroscience and pedagogy, the text argues that movement is a mode of intelligence. Hybrid intelligence becomes valuable only when approached as a



Funded by
the European Union

collaborator rather than a replacement. Expressive cognition — the shaping of thought through gesture, language and artistic intuition — remains irreducibly human. The chapter therefore advocates for artists and researchers to adopt technologies creatively rather than adapt themselves to technological constraints.

Chapter 5 extends this into an **organological worldview**. Stiegler's three interlocking organologies — human, technical and social — show how performers, tools and institutions co-evolve. IX, Immersive Experiences are not simply humans extended by machines; they are choreographies of multiple bodies: biological, anorganic and institutional. Each shapes the others through feedback loops that resonate with both Biggs' constructive alignment and the auto-poietic dynamics of performance. This perspective sharpens ethical concerns: as large swathes of our memories migrate into technical infrastructures, we must resist commercial capture and protect the diversity of embodied and indigenous knowledge. PREMiERE's toolbox development becomes a site of reflexivity, techno-diversity and stewardship — a playground for exploring alternative creativity rather than surrendering to default technological trajectories.

Chapter 6 and 7 brings these ideas to life by showing that artistic research is praxis. This research is a relational form of exchange, when we recognise that inquiry happens "in the middle," through entanglement and situated co-creation. Motion capture becomes a technological imaginary where inside-out and outside-in perspectives collide. Performers negotiate the tensions between lived experience and data abstraction, raising essential questions for art schools: what forms of judgement, criticality and care do students need in order to inhabit these imaginaries ethically? Through concepts such as sym-poiesis, auto-poiesis and cosmotechnics, Chapter 6 argues that artistic research can reconfigure worldviews and produce forms of knowing beyond Western metaphysical assumptions. In Chapter 7, these ideas are crystalized by Roman & ELIZA: a VR performance where digital puppetry and glitches become dramaturgical partners. The project exemplifies what Donna Haraway calls **response-ability**: the capacity to respond, to stay with the trouble, to attend to others, and to work through vulnerability as an ethical and creative force. Through this VR-experiment, applied research became an act of **generosity**: an exchange where performers, coders, dramaturgs and designers opened their methods, their bodies and their curiosity to each other. Roman & ELIZA exemplifies how the PREMiERE ethos operates in practice: not as a set of rules but as a relational attentional mode of co-creation.

This leads directly to the postcolonial concept of **worlding**. Technology is not a backdrop but a world-making partner. Every calibration, every artistic choice, every pedagogical design participates in shaping shared environments where meaning is produced. Worlding describes this ongoing co-composition of reality — the shared work of making and remaking the worlds we inhabit. Through the entangled processes explored in this deliverable, worlding becomes an ethical practice: a way of imagining, sensing and constructing the conditions for collective futures.

Chapter 8 returns to pedagogy by asking what immersive technologies can offer across artistic, institutional and societal contexts. Moving from macro to meso to micro levels, the chapter highlights how immersive environments influence learning, identity and ecological awareness. IDlab and the Immersive Arts Space at ZHdK serve as two models of immersive laboratories — one modest and open, the other institutionally expansive — both committed to sensorial immediacy, experimentation and interdisciplinary collaboration. Drawing on Chris Salter, Marshall McLuhan and Michael Century, the chapter situates immersion within a



Funded by
the European Union

lineage of cultural experimentation stretching from the Philips Pavilion to contemporary VR installations. It concludes by reconnecting immersion to responsibility: immersive tools can flow back into education, offering playful, expressive and embodied pathways for future generations.

Across all eight chapters, a central insight emerges and grounds this conclusion: **technology is most meaningful when it deepens our relationships to our histories, and to the futures we are capable of imagining.** Creating performances with data-driven technologies such as XR, generative AI and motion-capture demands a particular skillset from artistic and technical collaborators alike. Organising a performance research project that is both generative in terms of creative experimentation and ambitious on a technical level requires significant levels of cooperation and sensitization to the needs of team members. An organological awareness of the enmeshment of technical, social and human dimensions at play is paramount to making informed decisions about which imaginaries to evoke, what technologies are deployed and how, when protocols should be developed, the structuring of collaborative working process and so on. Only by considering the activities of research and education within this complexity can we re-shape knowledge production in a sustainable, just and ethically conscious manner. Given that XR-AI performance is a burgeoning field, we recommend further fieldwork which similarly shares the challenges and insights stemming from this novel form of artistic inquiry.

This conclusion therefore does not close the inquiry. Instead, it articulates an **ethical ecosystem** that can guide future work:

– generosity as epistemic hospitality;
– response-ability as ethical practice;
– expressive cognition as embodied intelligence;
– organology as co-evolution;
– worlding as shared reality-making;
– immersive and regenerative pedagogy as relational learning.

In this light, the deliverable can be read as an invitation to practice **response-ability** and engage consciously in **worlding**. Ethical temporalities, hopeful radicality, positional mapping, the irreducibility of the body, organological co-evolution, entangled praxis and immersive pedagogy together articulate a shared commitment: that creating with technology is never a matter of implementation alone. It is a deeply relational act through the negotiation of care, imagination, response-ability, vulnerability and stewardship. The PREMiERE project invites us to move forward not as passive inheritors of technological systems but as active contributors to worlds in motion — cultivating and capturing futures in which artistic diversity, ethical reflection, technological diversity and innovation remain fundamentally intertwined.

PREMiERE does not prescribe a single future; it offers an ecology of practices that allow us to move with technology — not as passive receivers, but as active contributors to worlds in motion.



Funded by
the European Union

# IV Bibliography


Akata, Z. et al. (2020). A Research Agenda for Hybrid Intelligence: Augmenting Human Intellect With Collaborative, Adaptive, Responsible, and Explainable Artificial Intelligence. In *Computer, 53*(8). pp. 18-28. https://doi.org/10.1109/MC.2020.2996587

Anderson, M. (2024). 4E Cognition and the Mind-Expanding Arts. *European Journal of Philosophy in Arts Education, 7*(02), 7–64. https://doi.org/10.5281/zenodo.7451462

Barabási,A-L. (2022, September 23). Why the World Needs 'Dataism,' the New Art Movement That Helps Us Understand How Our World Is Shaped by Big Data, *Artnet.* https://news.artnet.com/art-world-archives/introducing-dataism-2181005

Bakk, Á. K., & Makai, P. K. (Eds.). (2025). *Theorising and Designing Immersive Environments: Enchanting Spaces*. Palgrave Macmillan.

Bass, E. (2014). Visual Dramaturgy: Some Thoughts for Puppet Theatre-Makers. In D. N. Posner, C. Orenstein, & J. Bell (Eds.), *The Routledge Companion to Puppetry and Material Performance* (pp. 54–60). Taylor & Francis Group.

Biggs, J. (2022). *Teaching for Quality Learning at University*. Fifth ed., Open University Press.

Bleeker, M. (2008). *Visuality in the Theatre: The Locus of Looking*. Palgrave Macmillan UK.

Bleeker, M. (2017). *Transmission in motion: the technologizing of dance*. Routledge.

Bleeker, M. (2023). *Doing Dramaturgy: Thinking Through Practice*. Springer International Publishing.

Bloch, E. (1986). *The principle of hope*. Oxford: Basil Blackwell.

Borgdorff, H., Peters, P., Pinch, T. (Eds.). (2020). *Dialogues between artistic research and science and technology studies*. Routledge.

Braidotti, R. (2013). Nomadic Ethics. *Deleuze Studies*, *7*(3), 342–359. https://doi.org/10.3366/dls.2013.0116

Butler, J. (2014). *Bodies that matter: on the discursive limits of "sex"*. Routledge.

Cairo, A. (2021). Holding space: A storytelling approach to tramping diversity and inclusion. *Aminata Cairo Productions*. https://www.aminatacairo.com

Century, M. (1999). *Pathways to innovation in digital culture* (pp. 9-14). Montreal: McGill University.

Century, M. (2022). *Northern sparks : innovation, technology policy, and the arts in Canada from Expo 67 to the Internet age*. The MIT Press.

Ciarlo, G. (2020, October 22). A Regenerative Education for our times. *Resilience*. https://www.resilience.org/stories/2020-10-22/a-regenerative-education-for-our-times/

deGraf, B., & Yilmaz, E. (1999). Puppetology: Science or cult. *Animation World*, *3*(11).

deLahunta, S. (2016). Invisibility/corporeality. *Interactive Performance Series* (April 2001), Ohio State University.

deLahunta, S. & Vincent, J.B. (2020). Through the lens of choreographic process: Mixing reflexive perspectives on audiences and understanding, *Arts and the Market*, *10* (1), 53-64. https://doi.org/10.1108/AAM-07-2019-0024

Deleuze, G. (1994). *Difference and repetition* (P. Patton, Trans.). Columbia University Press. (Original work published 1968)

Deleuze, G. (2001). *Pure Immanence: Essays on a Life*. Zone Books.




Funded by the European Union

Dohmen, J. (2022). *Iemand zijn: Filosofie van de persoonlijke vorming.* Ambo|Athos.
Fischer-Lichte, E. (2008). *The Transformative Power of Performance*: *A New Aesthetics*. Routledge.
Foley, K. (2000). The Dancer and the Danced: Approaches Toward the Puppeteer's Art. *Puppetry International*, 8, 14–16.
Foster, S. L. (1997). Dancing Bodies. In J. C. Desmond, *Meaning in Motion* (pp. 235–257). Duke University Press.
Gallagher S. (2018). Decentering the brain: Embodied cognition and the critique of neurocentrism and narrow-minded philosophy of mind. *Constructivist Foundations*, *14*(1), 8–21.
Gallagher, S. (2023). *Embodied and enactive approaches to cognition*. Cambridge University Press. https://doi.org/10.1017/9781009209793
Gorny, R. A. & Radman, A. (2022). From Epiphylogenesis to General Organology, *Footprint 30. Footprint*, *16*(1). https://doi.org/10.7480/footprint.16.1.6291
Grau, D., & Zahm, O. (2020). Philosophy with Catherine Malabou. *purple MAGAZINE*, *33*. https://purple.fr/magazine/the-brain-issue-33/philosophy-with-catherine-malabou/
Grosfeld, T. (2025, November 22). *Tussen Mens en Machine. De Volkskrant*.
Hammelburg, E. (2021). *Being there live: how liveness is realized through media use at contemporary cultural events* [Dissertation].
Hansen, M. B. (2012). *Bodies in code: Interfaces with digital media*. Routledge.
Haraway, D. J. (1991). *Simians, cyborgs, and women: The reinvention of nature*. New York, Routledge.
Haraway, D. J. (2008). *When Species Meet*. University of Minnesota Press.
Haraway, D. J. (2016). *Staying with the trouble: Making kin in the Chthulucene*. Duke University Press.
Haraway, D. J., & Goodeve, T. N. (2000). *How Like a Leaf: An Interview with Thyrza Nichols Goodeve.* Psychology Press.
Hawking, S. W. (1993). *Hawking on the big bang and black holes*. World Scientific Publishing Company, Incorporated, Hackensack.
Hayles, N. K. (2006). Unfinished Work: From Cyborg to Cognisphere. *Theory, Culture & Society 23*(7-8), 159-166. https://doi-org/10.1177/0263276406069229
Hollanek, T., & Nowaczyk-Basińska, K. (2024). Griefbots, Deadbots, Postmortem Avatars: On Responsible Applications of Generative AI in the Digital Afterlife Industry. *Philosophy & Technology*, *37*(2), 63. https://doi.org/10.1007/s13347-024-00744-w
Honig, B. (2017). Public things: Democracy in disrepair. Fordham University Press.
Hui, Y. (2019). *Recursivity and contingency*. Bloomsbury Academic.
Hui, Y. (2024). *Machine and sovereignty: For a planetary thinking*. University of Minnesota Press.
Karreman, L. (2026). Cultural dreams of datafied bodies: Motion capture as a technological imaginary. In M. Bleeker & N. Zuniga Shaw (Eds.), *The Routledge Companion to Performance and Technology*. Routledge. (Forthcoming)
Karreman, L. (2017). *The Motion Capture Imaginary: Digital renderings of dance knowledge*. Ghent University.
Kozel, S., & Eeuwens, A. (2008). *Closer: Performance, Technologies, Phenomenology.* The MIT Press.
Latour, B. (2017). *Où atterrir? Comment s'orienter en politique*. Éditions La Découverte.
Latour, B. (2021). *Où suis je? Leçon du confinement à l'usage des terrestres*. Éditions La Découverte.



Funded by the European Union

Lévinas, E. (2016-1998). *Otherwise than being, or, beyond essence.* Duquesne University Press.

Lutz, C., Newlands, G., & Jarrahi, M. H. (2025). Hybrid Intelligence. In W. Xu (Ed.), *Handbook of Human-Centered Artificial Intelligence* (pp. 1-33). Springer. https://doi.org/10.1007/978-981-97-8440-0_87-1

Macrine, S. L., & Fugate, J. M. B. (2022). *Movement matters: how embodied cognition informs teaching and learning*. The MIT Press.

Malabou, C. (2010). *Plasticity at the dusk of writing: dialectic, destruction, deconstruction*. Columbia University Press.

Malabou, C. (2019). *Morning Intelligence: From IQ Measurement to Artificial Brains.* Columbia University Press.

Malabou, C. (2022). *What should we do with our brain?.* Fordham University Press.

Malabou, C., & Holierhoek, J. (n.d.). (2011). *Wat te doen met ons brein?* Boom.

Marinić, J. (2024). *Sanfte Radikalität: Zwischen Hoffnung und Wandel*. S. Fischer Verlag.

Öhman, C., & Floridi, L. (2017). The Political Economy of Death in the Age of Information: A Critical Approach to the Digital Afterlife Industry. *Minds and Machines*, *27*(4), 639–662. https://doi.org/10.1007/s11023-017-9445-2

Oosterling, H. (2016). *Waar geen wil is, is een weg: doendenken tussen europa en japan. Boom.*

Oosterling, H. (2020). *Verzet in ecopanische tijden: van ego-emancipatie naar eco-emancipatie*. Heiloo: Lontano.

Palmer, H., Hunter, V. (2018). Worlding. *New Materialism Almanac*. https://newmaterialism.eu/almanac/w/worlding.html

Paulsen, K. (2017). *Here/there: telepresence, touch, and art at the interface*. The MIT Press.

Pelluchon, C. (2018). *Éthique de la considération*. Paris: Éditions du Seuil.

Posner, D. N., Orenstein, C., & Bell, J. (2014). Introduction. In *The Routledge Companion to Puppetry and Material Performance* (pp. 1–12). Taylor & Francis Group.

Puig de la Bellacasa, M. (2017). *Matters of care: Speculative ethics in more than human worlds*. University of Minnesota Press.

Rachels, J. (2003). *The elements of moral philosophy*. McGraw-Hill.

Randolph, J. (1984). *Influencing Machines: The Relationship Between Art and Technology.* YYZ. https://e-artexte.ca/id/eprint/2929/

Rekveld, J. (2022). *Liberate the Machines!*. Gent: KASK & Conservatorium Gent.

Richter, G. (2011). *Afterness: Figures of Following in Modern Thought and Aesthetics.* Columbia University Press.

Roberts, B. (2012). Technics, individuation and tertiary memory: Bernard Stiegler's challenge to media theory. *New Formations, 77*(1), 8-20. https://doi.org/10.3898/NEWF.77.01.2012

Rowlands, M. (2010). *The new science of the mind.* Cambridge, MA: MIT Press.

Ross, D. (2021). From 'Dare to Think!' to 'How Dare You!' and Back Again. In J. P. N. Bradley & D. Kennedy (Eds.), *Bernard Stiegler and the Philosophy of Education* (pp. 148-158). Routledge.

Roy, Ivan du (2012, March 20). Bernard Stiegler: Le marketing détruit tous les outils du savoir [Interview]. *Basta!*. https://basta.media/bernard-stiegler-le-marketing-detruit-tous-les-outils-du-savoir



Funded by the European Union

Rumbley, L. (Host), & Cairo, A. (Guest). (2020, September 16). Aminata Cairo: The stories we tell [Podcast episode]. In *EAIE Podcast*. European Association for International Education. https://www.eaie.org/resource/podcast-aminata-cairo-stories-we-tell.html

Russell, S. J. (2020). *Human compatible: artificial intelligence and the problem of control*. Penguin Books.

Santos, E. (2024a). O arquivo como ressurgimento: Notas para uma estética globular. *Revista Estud(i)os de Dança, 2*(1), 1–14. https://doi.org/10.53072/RED202401/00209

Santos, E. (2024b, July 20). Importance of dance archiving: From preservation to resurgence. *Premiere.* https://premiere-project.eu/importance-of-dance-archiving-from-preservation-to-resurgence/

Salter, C. (2010). *Entangled: technology and the transformation of performance*. MIT Press.

Salter, C. (2024). *Sensing Machines: how sensors shape our everyday life*. MIT Press.

Salter, C., & Pickering, A. (2015). Alien agency: experimental encounters with art in the making. The MIT Press.

Salter, C. (2024). Experiencing data – discovering space: Immersive arts for learning [PDF]. Research Catalogue.
https://media.researchcatalogue.net/rc/master/01/a6/0b/43/01a60b43cd71d4c407cc8e3eb006dbd5.pdf

Santos, E. (2024). O arquivo como ressurgimento: Notas para uma estética globular. *Revista Estud(i)os de Dança RED, 2*(1). https://doi.org/10.53072/RED202401/00209

Simondon, G. (2020). *Individuation in light of notions of form and information* (T. Adkins, Trans.). University of Minnesota Press. (Original work published 1958)

Sisto, D. (2021, January 4). Chatting With the Dead. *The MIT Press Reader*. https://thereader.mitpress.mit.edu/chatting-with-the-dead-chatbots/

Snel, H. (2023). Reflection and Assessment Syllabus: For lecturers at the Amsterdam Academy of Architecture (Version 1.0) [Internal document]. Academy of Architecture, Amsterdam University of the Arts.

Smith, A. (2025, June 21). Waar zijn de goede tijden gebleven? *de Volkskrant.*

Spivak, G. C. (1985). Three Women's Texts and a Critique of Imperialism. *Critical Inquiry*, *12*(1), 243–261. https://doi.org/10.1086/448328

Stiegler, B. (1998). *Technics and time. vol.1*. Stanford University Press.

Stiegler, B. (2010). *Taking care of youth and the generations*. Stanford University Press.

Stiegler, B. (2014). *For a new critique of political economy* (English ed., 2nd repr). Polity Press.

Stiegler, B. (2015). *States of shock: stupidity and knowledge in the twenty-first century*. Cambridge: Polity Press.

Stiegler, B. (2015). *Symbolic misery. 2 : the katastroph of the sensible* (English). Cambridge: Polity Press.

Stiegler, B. (2020). Elements for a General Organology. *Derrida Today*, *13*(1). https://www.euppublishing.com/doi/10.3366/drt.2020.0220

Stiegler, B., & Barker, S. (2009). *Technics and time. 2, Disorientation*. Stanford University Press.

Stiegler, B., Buseyne, B., & Samyn, L. (2007). *Als een vliegende vis: over de wording van een filosoof*. Garant.

Stiegler, B., Ross, D. (2018). *The neganthropocene*. London: Open Humanities Press.

Stokes, P. (2024, September 7). Should we fear the deathbots? *Digital Death: Transforming History, Rituals and Afterlife.* University of Helsinki. https://www.helsinki.fi/en/researchgroups/digital-death-transforming-history-rituals-and-afterlife/blog/should-we-fear-the-deathbots



Funded by the European Union

Swierstra, T., Lemmens, P., Sharon, T., Vermaas, P. (2022). *The technical condition: the entanglement of technology, culture, and society*. Boom.
Thelen, E. (1995). Time-scale dynamics in the development of an embodied cognition. In R. Port and T. van Gelder *(Eds.), Mind In Motion*. MIT Press.

Thelen, E., & Smith, L. B. (1994). *A dynamic systems approach to the development of cognition and action*. MIT Press.
Vanhoutte, K., & Wynants, N. (2010). Immersion. In R. Nelson, A. Lavender, S. Bay-Cheng, & C. Kattenbelt (Eds.), *Mapping Intermediality in Performance* (p. 47). Amsterdam University Press.
Virilio, P. (2010). *Le Grand Accélérateur.* Éditions Galilée.
Volkmer I., Deffner F. (2010). Eventspheres as discursive forms: (Re-)negotiating the 'mediated center' in new network cultures. In Couldry N., Hepp A., Krotz F. (Eds.), *Media events in a global age* (pp. 217–230). Routledge.
Weizenbaum, J. (1966). ELIZA — *A computer program for the study of natural language communication between man and machine.* Communications of the ACM, 9(1), 36–45. https://doi.org/10.1145/365153.365168
Weizenbaum, J. (1976). *Computer power and human reason: from judgment to calculation*. W.H. Freeman.
Welch, S. (2022). *Choreography as embodied critical inquiry: embodied cognition and creative movement*. Palgrave Macmillan.
Wessels, K.R.; Grünwald, L. (2023). Fulfilling the Regenerative Potential of Higher Education: A Collaborative Auto-Ethnography. *Education Sciences*, *13*(10). https://doi.org/10.3390/educsci13101037
Wilson, E. O. (1999). *Consilience: The Unity of Knowledge*. Vintage Books.
Winnicott, D. W. (1965). *The maturational processes and the facilitating environment: Studies in the theory of emotional development*. Hogarth Press and the Institute of Psychoanalysis.
Winnicott, D. W. (1971). *Playing and reality.* Tavistock Publications.

# V Webgraphy

Academie voor Theater en Dans Amsterdam (Director). (2023, January 20). ATD Research Month 2023—Lectorate of the Academy of Theatre and Dance [Video recording]. https://www.youtube.com/watch?v=bNJXDMbhX9w
Academy of Theatre and Dance (AHK). (n.d.). Regenerative Art Education. https://www.atd.ahk.nl/en/atd-lectorate/projects/regenerative-art-education/
ALLEA, All European Academies. (2013, September). Ethics Education in Science. https://allea.org/portfolio-item/ethics-education-in-science/
ALLEA, All European Academies. (2023, June). European Code of Conduct 2023. https://allea.org/portfolio-item/european-code-of-conduct-2023/
Amsterdam Institute for Advanced Metropolitan Solutions (AMS Institute). (n.d.). https://www.ams-institute.org/
Amsterdam University of Applied Sciences. (2025, December 13). https://www.amsterdamuas.com/



Funded by the European Union

Amsterdam University of the Arts (AHK). (n.d.-a). CASE (Centre for Arts & Sciences Education). https://www.ahk.nl/en/research/case-centre-for-arts-sciences-education/
Amsterdam University of the Arts (AHK). (n.d.-b). Research Group Social Justice and Diversity in the Arts. Amsterdam University of the Arts. https://www.ahk.nl/en/sjda/
Amsterdam University of the Arts (AHK). (2024). Strategic Plan 2024-2029. https://www.ahk.nl/en/about-the-ahk/mission/strategic-plan/
Amsterdamse Hogeschool voor de Kunsten (AHK). (n.d.). Impression of Unlearning Language. https://www.ahk.nl/onderzoek/artist-in-residence-air/2021-2022/school-of-unlearning-2022/impression-of-unlearning-language/
Bildung, B. für politische. (2023, November 12). I. Die Grundrechte. bpb.de. https://www.bpb.de/themen/menschenrechte/grundgesetz/44187/i-die-grundrechte/
Die Bundesregierung. (2024, January 27). Die Nummer 1 in unserer Verfassung. bundesregierung.de. https://www.bundesregierung.de/breg-de/service/archiv-bundesregierung/artikel-1-grundgesetz-2256470
European Commission, Directorate-General for Communications Networks, Content and Technology. (2024, March 26). *Artificial Intelligence Act.* https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai
European Commission, Directorate-General for Communications Networks, Content and Technology. (2019, April 8). *Ethics guidelines for trustworthy AI. Shaping Europe's digital future.* https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai
Fonds Podium Kunsten. (n.d.). Meerjarige productiesubsidies 2021-2024. MEERJARIGE SUBSIDIES 2021-2024 FONDS PODIUMKUNSTEN. https://meerjarig.fondspodiumkunsten.nl/adviezen+meerjarige+productiesubsidies/categorie+iii/ick/
MOCO'24. (n.d.). MOCO'24 | 9th International Conference on Movement and Computing. https://moco24.movementcomputing.org/
NRO, The Netherlands Initiative for Educational Research. (2025). The Dutch Education Award for secondary vocational education and higher education. https://www.nro.nl/en/onderwijspremie



Funded by the European Union

# VI Appendices

The following appendices provide supplementary material that supports, documents and contextualises the analyses presented in the main body of this deliverable. They include workshop documentation, dissemination materials, technical system overviews and pedagogical visualisations referenced throughout Chapters 5–8. Each appendix begins on a new page and is organised according to thematic relevance.

## List of Appendix Figures





Funded by the European Union

## Appendix A. Workshops and Training Sessions

This appendix contains visual and contextual documentation of PREMiERE-related workshops, training sessions and experimental ateliers conducted at the Academy of Theatre and Dance. These materials serve to illustrate the broader educational ecosystem in which the project's research activities were embedded.

**Figure A1**. *School of Unlearning* workshop by Thomas Talawa Prestø

Tabanka Dance Company, Photocredit: Sigrun Drivdal Johnson.

**Figure A2.** *A Touching Performance*

directed by Ariadna Rubio Lleó. Photocredit: Sjoerd Derine



Funded by the European Union

**Figure A3**. Open House ATD (PREMiERE presentation)

| | | |
|---|---|---|
| **Jason Winter 2024...: #Ai** | **#Unreal #Resolume** | **#Motion Capture** |
|  |  |  |
|  |  |  |
|  |  |  |
| **#Supercollider #SpatialAudio** | **@IDlab Open Studio, Jan 27th** | **co-prod: Stocos & PREMiERE** |

Open House ATD, 27 January 2024 @IDlab Studio STO & PREMiERE.
Dancer: Jason Winter, alumnus of the ATD, in collaboration with Pablo Palacio and Daniel Bisig. Demonstration of free style dance interacting with generative algorithms and sonifaction with body sensors and SuperCollider.



Funded by the European Union

**Figure A4.** Experimental Atelier #1 – Co-creation session

May 2024. Intuitive Body and AI with Stocos and ICK @ AHK IDlab.
Dancer: Victor Callens (left), Clarinettist: Carjez Gerretsen (right)
Photo: Francesco Cutillo

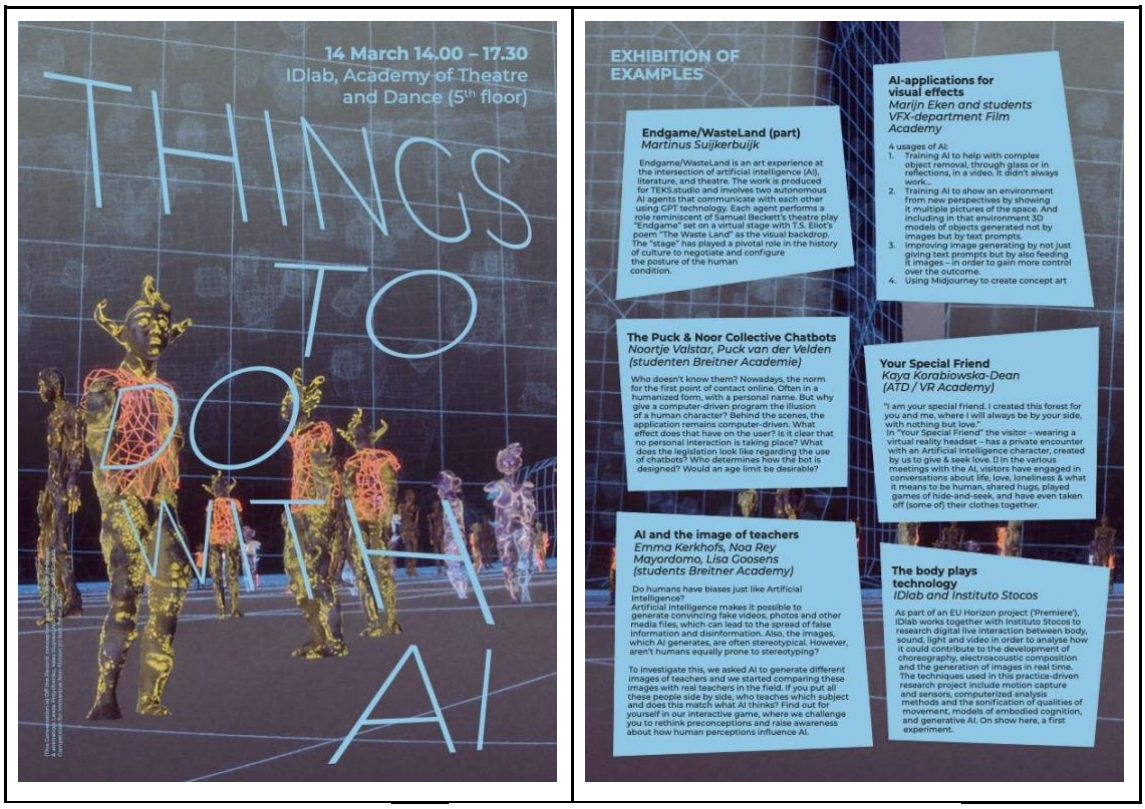


Funded by
the European Union

## Appendix B. Dissemination Materials

Appendix B gathers outreach and public-facing materials produced during the project period, such as flyers, posters, conceptual sketches and artistic artefacts related to the project's thematic explorations. These documents provide insight into the communication and dissemination strategy of PREMiERE

**Figure B1.** Flyer: *Things to do with Ai* (2024)




Design: Stefan van de Heuvel - with *The body plays technology*, STO and AHK.



Funded by the European Union

**Figure B2.** Flyer: *More Things to Do with AI* (2025)



Design: Simone C. Niquille

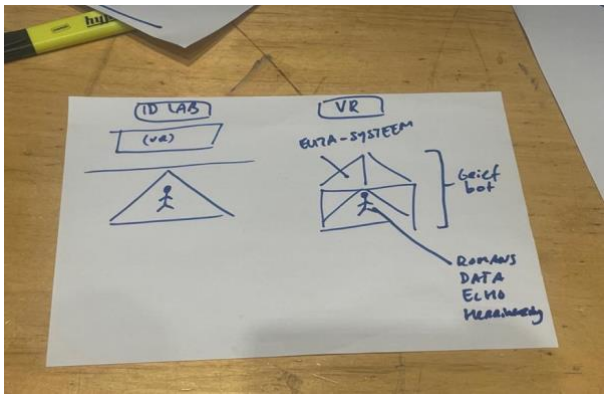


Funded by the European Union

## Appendix C. Technical Architectures and Prototypes

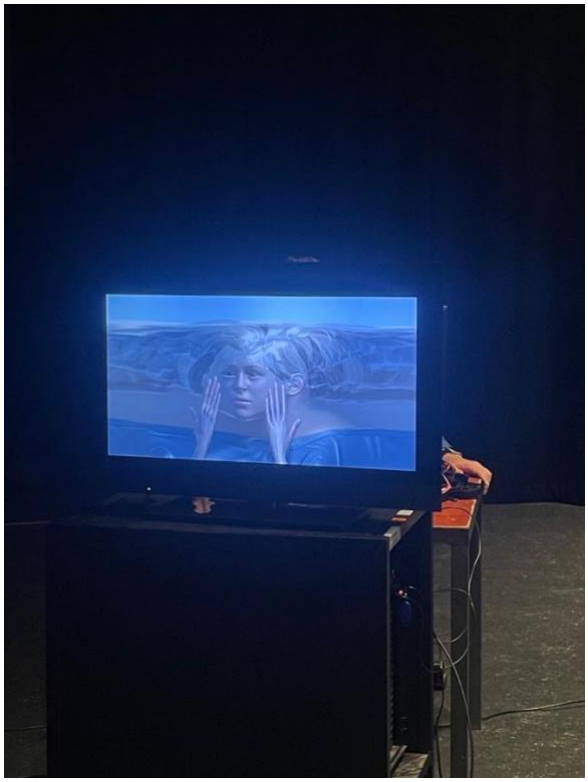
This appendix presents technical diagrams, early prototypes and system-based representations that informed the development of the PREMiERE performance environments. These visual materials complement the methodological and architectural discussions in Chapters 4 and 7.

**Figure C1.** Sketch of physical and virtual screen configuration




Design: Keez Duyves
Ulrike Quade Company & IDlab, May 2025. Photo: Sorcha Ní Bhraonáin.

**Figure C2**. Inorama face-camera prototype



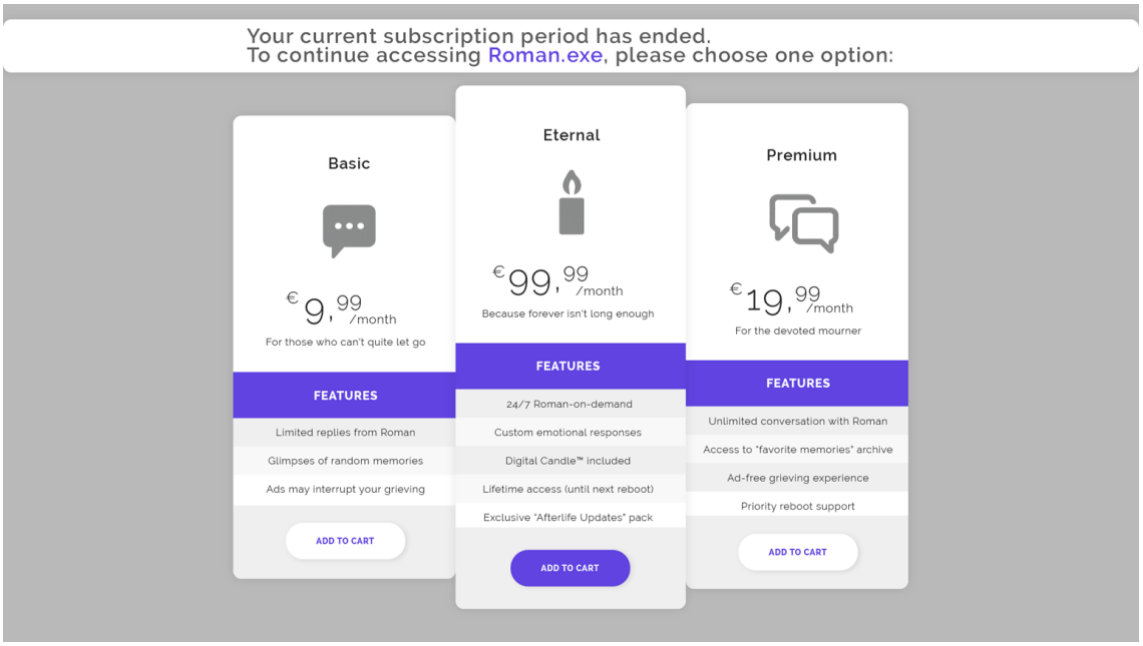
Design and Realisation: Keez Duyves.



Funded by the European Union

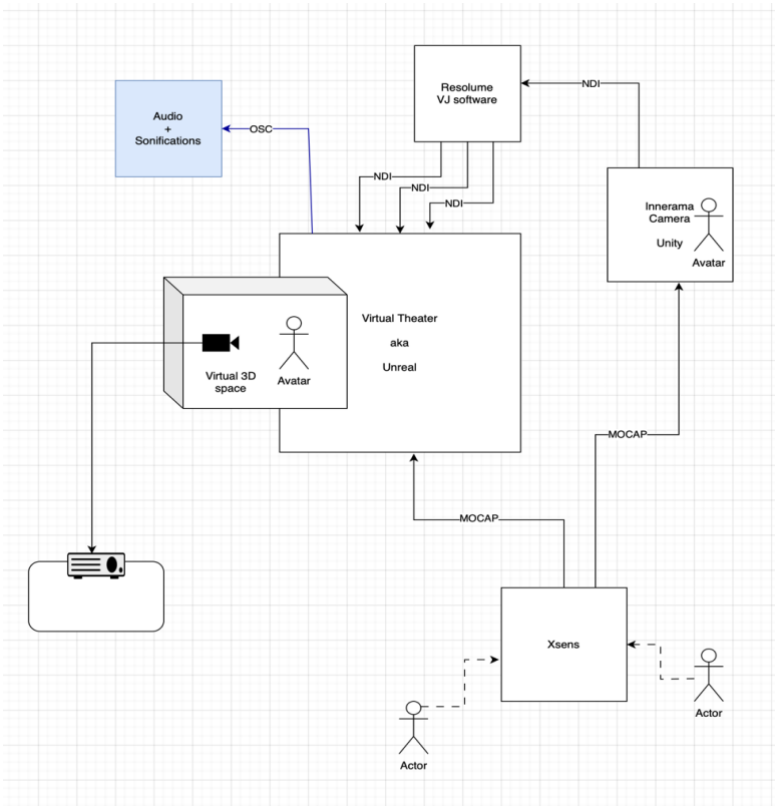
Ulrike Quade Company & IDlab, May 2025. Photo: Sorcha Ní Bhraonáin.

**Figure C3**. *End of Subscription – Roman.exe*




Graphic design: Mark Thewessen
Ulrike Quade Company & IDlab, September 2025.

**Figure C4**. Networked communication diagram for VR experiment



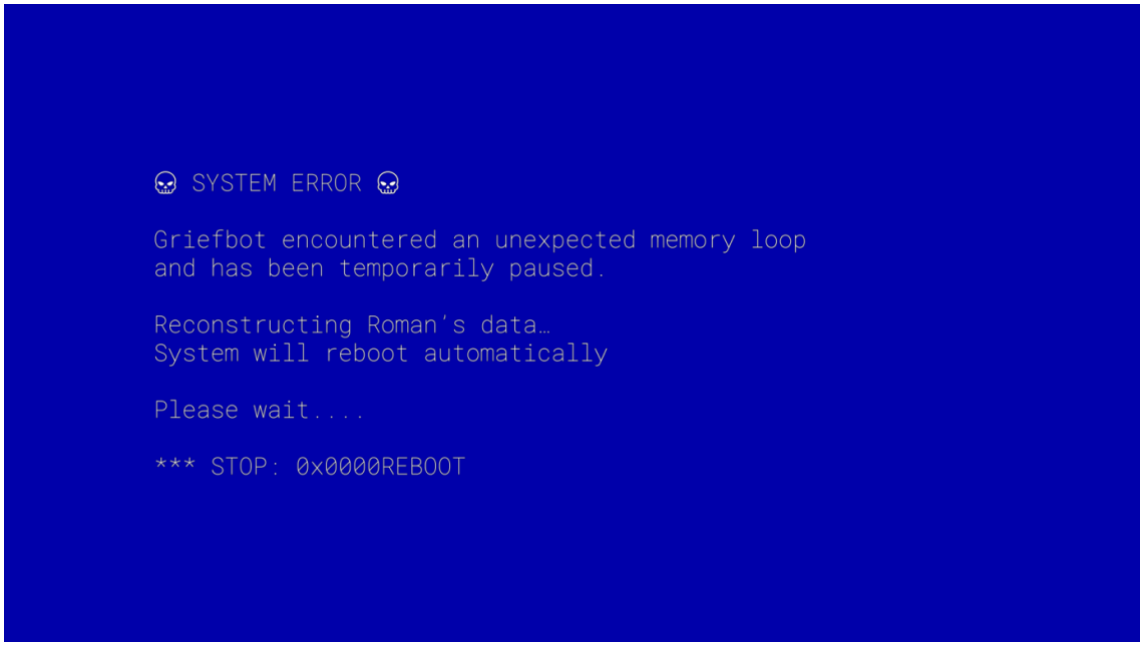

Design: Keez Duyves Diagram for VR Experimentation of Roman & ELIZA.



Funded by the European Union

Ulrike Quade Company & IDlab, September 2025

**Figure C5.** System Error for Rebooting




Graphic design: Mark Thewessen, Ulrike Quade Company & IDlab, September 2025



Funded by
the European Union

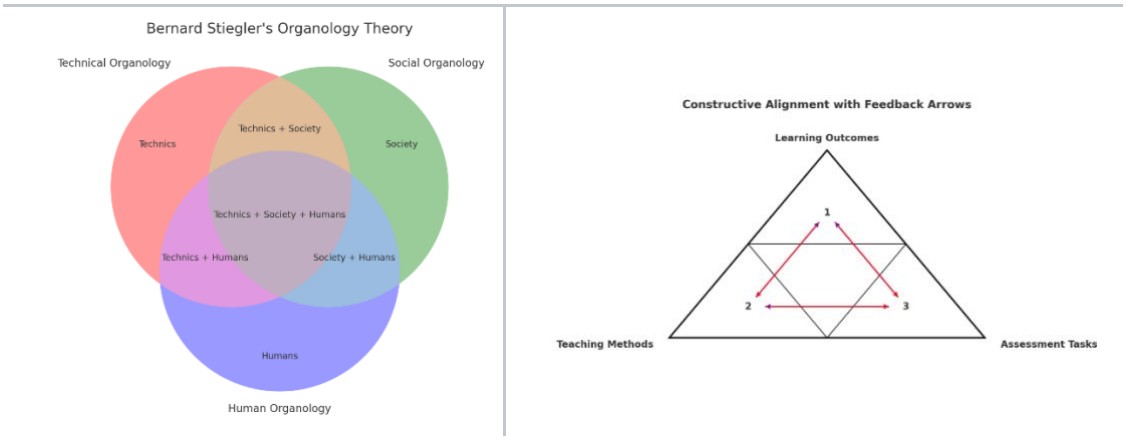
## Appendix D. Pedagogical Visualisations

Appendix D contains visual material that supports the pedagogical reflections in Chapter 8, including examples of embodied learning tools and organological design sketches developed during the project. These materials illustrate how immersive technologies intersect with educational practice.

**Figure D1.** *Maths Dance* learning example


Teaching through movement, Learning through fun! Pandora Baka, founder of Maths Dance

**Figure D2.** Organology diagrams and Constructive Alignment






Funded by the European Union

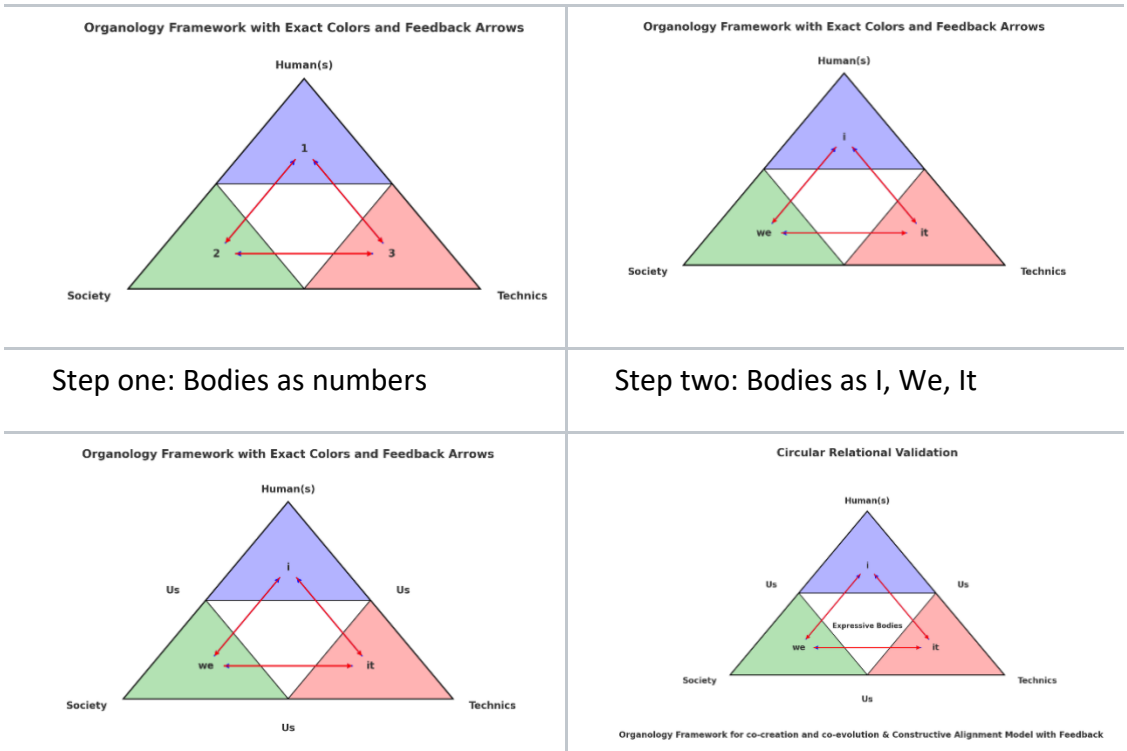



**Figure D2.** Organology diagrams and Constructive Alignment presented @ IDlab. Erik Lint (2024).



Funded by the European Union