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**Beyond the Body:
Unravelling the Nexus of XR
Dance, Collaborative Practice and
Politics.**

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2026

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Summary

This practice-as-research thesis explores how the integration of immersive technologies alters the conditions of choreographic practice. It attends to three interrelated areas: 1) choreographic methods, 2) the posthuman performing body, and 3) the emergence of new conditions of performance in extended reality (XR), requiring new ethical and collaborative frameworks for these practices. Drawing on dance theory, immersive performance, posthumanism, Greek philosophy and semiocapitalism, the project develops a conceptual framework for understanding dancing bodies within computer-generated and virtual environments. Simultaneously, it situates XR dance within its cultural contexts, drawing out theoretical and political implications of this integration.

Four creative experiments underpin the fusion of theory and practice, each advancing the dialogue between conceptual exploration and choreographic practice. These interdisciplinary, collaborative dance works build upon each other, with each new work adding a layer to the last. *Art.i.Fact* is a pre-recorded motion capture performance experienced through a virtual reality headset. *Traversing Spaces* employs a mixed-reality approach, allowing audiences to experience both virtual and physical world simultaneously. *The Front* uses live motion capture in front of a co-present audience to interrogate liveness, interactivity, and data ethics. A final work, *Untitled*, conceptualises hybrid, distributed performance as a porous membrane through which digital and physical realities are continuously negotiated. Methodologically, they engage Jo Butterworth's eight-stage choreographic process alongside Lyle Skains' ethnomethodology to capture processual and reflective data.

This research generates significant findings across three levels: first, technological structures can prioritise specific movement vocabularies and aesthetic hierarchies, and core spatial and temporal structures are reconfigured through enmeshment with technological logics. Second, the posthuman performing body is both constituted and destabilised through its technological interface, reconceptualised here as a somatic chora. Third, live immersive performance requires new mechanisms for engaging with the persistent data flows it produces. By integrating theoretical inquiry and choreographic experimentation, this study contributes to a critical understanding of XR dance as an emergent performance form. It offers new

insights into embodiment, relationality and ethics in technologically mediated choreography and argues for practice-informed ethical frameworks that push beyond the legal imperatives of labour union negotiations in service of equitable and transparent working conditions in the sector.

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Chapter 1. Introduction

1.1 Introduction

On a sunny Wednesday in September, I rolled myself off the back of a 1.5m high structure that I had constructed in the Samuel Beckett Theatre as part of a practice experiment that would become central to this research. As I hung there, upside down, gripping the Oculus Quest that was strapped on my head, I realised that its zero point, or the spatial point it uses to calibrate its understanding of the physical, and then digital space around it, had vanished. When I pulled myself upright, the virtual space I saw through the headset no longer aligned with the physical room beneath me. My body, caught between incompatible spatial logics, experienced what I would come to understand as a productive ontological crisis: the technology revealed its embedded assumptions about how bodies should be orientated, where and how they should move, and what constitutes coherent space. This moment of technological failure became a choreographic and theoretical provocation. It demonstrated that immersive technologies do not simply mediate performance; they carry implicit theories of embodiment, agency, spatial intelligibility, and movement patterning. This research project investigates what happens when choreographic practice actively refuses, tests, and reimagines these embedded assumptions through four practice-as-research performance works. Treating technological systems not as neutral tools but as co-constituting partners in creating knowledge, these works generate insights into making, meaning, and ethics that emerge only through the interweaving of theoretical inquiry with choreographic practice.

To understand what was at stake at this moment requires situating it within the broader field of extended reality (XR) dance, an emergent practice in the field of contemporary dance. The umbrella term used to describe computer-generated environments that (often) merge the physical and virtual worlds, XR encompasses augmented reality (AR), virtual reality (VR) and mixed reality (MR). Its adoption in dance requires an aesthetic and conceptual reappraisal of how moving bodies in computer-generated and virtual environments evoke meaning and experience. Similarly, it necessitates rethinking performer/technology/audience relationships in both practical and theoretical terms.

1.2 Research Questions

This four-year research project examines the interaction of dance theory, choreographic practice, and cultural policy through a practice-as-research framework. The following research questions were central to its development:

- 1) How does choreographic practice integrate immersive and capture technologies to generate new compositional methodologies and creative possibilities?
- 2) What conditions of embodiment, agency and liveness emerge when the performing body is mediated through these technological apparatuses?
- 3) What ethical and collaborative frameworks are required for performance practices when bodily data is extracted, circulated, and mediated through immersive and capture technologies, and how can these be generated through practice-as-research?

These questions form a trajectory from making to meaning to ethics, moving from compositional strategies (RQ1) through ontological conditions (RQ2) to ethical imperatives (RQ3). They are interrelated: the compositional methodologies I develop (RQ1) both shape and are shaped by the conditions of embodiment they produce (RQ2), which in turn demand ethical frameworks for practice (RQ3). Each question requires practice-based investigation; they cannot be answered through theoretical inquiry alone. The choreographic works at the heart of this research generate knowledge through making, revealing insights that emerge only when bodies, technologies, and conceptual frameworks collide in the studio.

1.3 The Practice Works

These questions are investigated through four performance works that function as research outputs, not case studies. Each work engages with specific, sometimes intersecting dimensions of the overarching enquiry.

Art.i.Fact (European Research Night, Furthr Fest 2022, Dublin Tech Week @ The Lab Gallery, 2025).

This 5-minute solo VR dance work investigated motion capture technology's capacity to reshape choreographic agency and process (RQ1). One dancer was recorded using a Vicon motion capture system, and the data was used to build a custom particle system in Unity game engine. The choreography was designed to unearth the movement capabilities of this specific motion capture equipment, which included testing occlusion, precision,

and velocity. It also explored the notion of unbounded space and viewer proximity through using trajectories that directly engaged the viewer, inviting them to move in response to the avatar, thus framing a new relationality and viewpoint. This process is further detailed in chapter 2.

Documentation: Full recording available in Appendix A¹

Traversing Spaces (360Q, Prague Quadrennial, 2023)

A co-creation with scenographer Tania X, this three-hour durational mixed reality work engaged notions of agency and spectatorship across three layers: full VR immersion with VT headset, hybrid engagement with a motion tracker and physical reality situatedness. Using lidar scanning, I mapped the digital environment directly onto the physical environment, and engaged choreographic principles including time, spatial generation, levels, and focus. This work was not designed for professional performers – it was structured in such a way that the audience, or users, became the performers themselves through elements that facilitated interaction within and between the layers. As the tracker appeared to the audience members fully immersed, a relationship began to develop, sometimes sustaining across several minutes and sometimes losing and re-finding itself. This work primarily addresses RQ1 and RQ2, but it began to lay the foundations for investigating RQ3. The process and findings are outlined in chapter 2.

Documentation: Excerpts available in Appendix B

The Front (Dublin Theatre Festival, 2023)

This solo dance work used a Perception Neuron motion capture suit in live performance, generating a live scenography for an audience seated in the round. Its two primary areas of investigation lay in testing motion capture technology in a live performance environment, and the performing body's relationship to predictive systems (RQ2). The dancer wore a motion capture suit, and his movement was tracked and projected in real-time alongside his live performing body. Again, the choreography deliberately tested the system's limits, exploring what movements were legible to the technology and where it failed. It also considered how the audience, not wearing motion capture suits, could be rendered in the digital realm. Through designing moments of audience interaction, their presence became visible in the form of negative space juxtaposed with the live, moving

¹ Links to documentation are available in the relevant appendix and through a permalink on TARA.

avatar of the dancer. The ethical considerations in this work address RQ3, and findings are detailed in chapter 4.

Documentation: Rehearsal footage and excerpts available in Appendix C

Untitled (Samuel Beckett Theatre, 2024)

In collaboration with scenographer Robin Krijgsman, this solo work investigates the ontological nature of a hybrid performing body through integrating virtual reality into the choreographic score. It incorporated a Quest Pro VR headset into the choreography to immerse the performer in a hybrid reality during the performance. The choreography challenged the technology's understanding of space; as I detail at the very beginning of this introduction, the failure of the headset under a non-normative spatial configuration caused a destabilisation in the performer's body schema (RQ2). It exposed its own logic, making visible the technology's expectations about how space should operate and how bodies should move. Chapter 3 details its process and findings.

Documentation: Full performance recording and excerpts available in Appendix D

1.4 Situating the Practice: Artistic and Theoretical Contexts

1.4.1 Practice Genealogies

In historical terms, art practice has often been a hospitable testing ground for new technologies; from camera obscura, through to Bauhaus experiments with industrial materials, mid-century new media art, and contemporary digital practices, amongst many others.² As Wamberg and Paldam note, the proximity of art practices to the physical processes of technology and nature picked up pace with Avant Garde movements including Fluxus and Situationism in the 1960s and 1970s.³ They argue that the notion of “interactivity...converts the artist into an agent who is doing something with, and in, the world, rather than merely reflecting it”;⁴ that the dissolution of the boundary between the artistic artifact (labelled technology) and its viewer through the invitation to interact signals a breakdown of former silos.⁵ Further examples of research charting this

² Widewalls Editorial, 'The Serious Relationship of Art and Technology - Artsper Magazine', Artsper Magazine, 2025, <https://blog.artsper.com/en/lifestyle/the-serious-relationship-of-art-and-technology/>.

³ Jacob Wamberg and Camilla Skovbjerg Paldam, eds, *Art, Technology and Nature: Renaissance to Postmodernity* (Ashgate Publishing, Ltd., 2015).

⁴ Wamberg and Skovbjerg Paldam, *Art, Technology and Nature*, 2.

⁵ Ibid

reorientation include Néill O'Dwyer's analysis of digital scenography across the last thirty years⁶ alongside his edited collection, *Extended Reality Performance: Scenographic Practice in Virtual and Augmented Reality Technologies*,⁷ which offers practitioner perspectives on the creative processes that define XR practices; *Women, Art and Technology*, which charts the contribution of women artists, curators, theorists and critics to the field of new media;⁸ *Explorations in Art and Technology*, in which artists and researchers explore the historical intersections, alongside contemporary practice and challenges.⁹ Finally, Steve Dixon's seminal work, *Digital Performance: A History of New Media in Theatre, Dance, Performance Art and Installation* traces the evolution of digital media practices across the performing arts and offers a theoretical contextualisation of changing body, spatial and temporal representations.¹⁰

This project builds on a deep legacy of choreographic practice in the domain of dance and technology, from Merce Cunningham to Troika Ranch, Chunky Moves, Klaus Obermaier, DAP-Lab, William Forsythe, and Wayne McGregor & Scott deLahunta via their Choreography and Cognition (2003-2004)¹¹ project. More recent XR dance work includes *Celestial Motion I* (2018),¹² *Celestial Motion II* (2020),¹³ and *Anti-Body* (2022)¹⁴ by Alexander Whitley; *Le Bal de Paris* (2021)¹⁵ by Bianca Li; *La Comédie Virtuelle* (2020)¹⁶ by Cie Gilles Joban, and *DAZZLE* (2020),¹⁷ *PAN+TILT* (2022),¹⁸ and

⁶ Néill O'Dwyer, *Digital Scenography: 30 Years of Experimentation and Innovation in Performance and Interactive Media* (Bloomsbury Publishing, 2021).

⁷ Néill O'Dwyer, ed., *Extended Reality Performance : Scenographic Practice in Virtual and Augmented Reality Technologies*, 1st ed. (Bloomsbury Publishing, 2025).

⁸ Judy Malloy, ed., *Women, Art, and Technology*, Leonardo (MIT Press, 2003).

⁹ Linda Candy et al., *Explorations in Art and Technology*, Springer Series on Cultural Computing (Springer London, 2018).

¹⁰ Steve Dixon, *Digital Performance : A History of New Media in Theater, Dance, Performance Art, and Installation* (MIT Press, 2007).

¹¹ Rosaleen McCarthy et al., 'Bodies Meet Minds: Choreography and Cognition', *Leonardo* 39, no. 5 (2006): 475–77.

¹² Alexander Whitley, *Celestial Motion I*, 2018, <https://www.alexanderwhitley.com/screen/celestial-motion-1>.

¹³ Alexander Whitley, *Celestial Motion II*, 2020, <https://doi.org/https://www.alexanderwhitley.com/immersive-and-interactive/celestial-motion-2>.

¹⁴ Alexander Whitley, *Anti-Body*, 2022, <https://www.alexanderwhitley.com/current/anti-body>.

¹⁵ Bianca Li, *Le Bal de Paris*, 2021, <https://blancali.com/en/agenda/le-bal-de-paris-a-chaumont/>.

¹⁶ Gilles Joban, *La Comédie Virtuelle*, 2020, <https://www.gillesjoban.com/creation/comedie-virtuelle-live-show/>.

¹⁷ Ruth Gibson and Bruno Martelli, *DAZZLE*, 2020, <https://gibsonmartelli.com/portfolio/dazzle/>.

¹⁸ Ruth Gibson and Bruno Martelli, *PAN+TILT*, 2022, <https://gibsonmartelli.com/portfolio/pantilt/>.

WOW+FLUTTER (2024)¹⁹ by Gibson/Martelli.²⁰ Of these artists, it is Cunningham, Forsythe and McGregor who have impacted my artistic trajectory most profoundly. Their work is rooted in a classical language, a grammar that is inscribed on my body through my training and thus deeply accessible to me. However, it is their collective commitment to innovation that has been most impactful. From Cunningham's early experimentation with improvisation and motion capture, to Forsythe's technical innovation (by this I mean ballet technique, not technology) and his establishment of MotionBank, a digital archiving project in 2010, to McGregor's collaborations with cognitive scientists and technologists across his career. Each of these choreographers expands their community of practice beyond the discipline of dance, establishing relationships and relevance within an extended creative context. Their working methods have also shaped my scholarly engagement with dance, offering a model of interdisciplinary praxis and situatedness that imagines dance beyond its artistic remit, as a locus of enquiry and embodied knowledge.

While there is comprehensive analysis on earlier innovative works at the intersection of dance and technology,²¹ there is presently limited academic literature that analyses specific XR dance artefacts (in a manner analogous to, say, screendance or theatre dance), and few that propose strategies to this end. Sophy Smith puts forward perhaps the only framework, pointing to three commonalities of VR dance works that she suggests constitute grounds for analysis.²² These are: 1) types of work and audience role, which is further segmented to active, participatory and interactive; 2) collaborative partnerships; and 3) the development of new languages and new audiences.²³ However, it

¹⁹ Ruth Gibson and Bruno Martelli, *WOW+FLUTTER*, 2024, <https://gibsonmartelli.com/portfolio/wowandflutter/>.

²⁰ See Appendix E for a comprehensive list of related XR works (since 2013).

²¹ See O'Dwyer, *Digital Scenography* for an overview.

²² Sophy Smith, 'Dance Performance and Virtual Reality: An Investigation of Current Practice and a Suggested Tool for Analysis', *International Journal of Performance Arts and Digital Media* 14, no. 2 (2018): 199–214, <https://doi.org/10.1080/14794713.2018.1509256>.

²³ Smith, 'Dance Performance and Virtual Reality'.

is possible to extend this thinking to integrate evaluative frameworks for VR artefacts from cultural heritage²⁴ or opera.²⁵

This practice development has been largely artist led. Earlier XR works primarily involved 180-degree, 360-degree, or volumetric video, which was pre-recorded and transposed into a virtual environment. This was a logical next step to dance on film, and the approach was particularly favoured by ballet companies, perhaps on account of its often-long-standing repertoire which offers little flexibility to experiment with new potentialities of XR technologies and audience demographics. As technology developed, we began to see artists experiment with liveness, embracing newer motion capture systems and virtual environments with real-time potentialities. Most recently, artists including Gibson/Martelli, AΦE Aoi + Esteban and Alexander Whitely have begun to incorporate AI systems into their work alongside XR technologies. The four works that constitute this research project intervene in the field firstly by engaging with real-time mocap in generating a live scenography at quite an early stage (2022-2023) and by considering how spatial slippage, between physical and digital environments, might operate for a performer in front of a live audience. Though these are not seismic shifts in artistic methodology and clearly build on a growing body of similar approaches, they offer a considered account of both process and output in a way that few practitioners making work in this way have been able to articulate. Further, the way in which the work considers its inherent ethical positioning within current industry policy frameworks, primarily those offered by SAG-AFTRA and Equity UK, makes a significant departure from both practitioner-led and researcher-led considerations of XR dance works.

²⁴ Maria Economou and Laia Pujol, 'Educational Tool or Expensive Toy? Evaluating VR Evaluation and Its Relevance for Virtual Heritage', in *New Heritage*, ed. Yehuda Kalay et al. (Routledge, 2007), <https://doi.org/https://doi.org/10.4324/9780203937884>; Néill O'Dwyer et al., 'Volumetric Video in Augmented Reality Applications for Museological Narratives: A User Study for the Long Room in the Library of Trinity College Dublin', *Journal on Computing and Cultural Heritage* 14, no. 2 (2021): 1–20, <https://doi.org/10.1145/3425400>; Roberto Pierdicca et al., 'Evaluating Augmented and Virtual Reality in Education Through a User-Centered Comparative Study: SmartMarca Project', in *Virtual and Augmented Reality in Education, Art, and Museums* (IGI Global, 2020), <https://doi.org/10.4018/978-1-7998-1796-3.ch012>.

²⁵ Anna Matamala and Caoimhe Wandel-Brannigan, 'Co-Creating a Community VR Opera: An Analysis of the Final Opera in the Framework of a Co-Creation Process', *Articles, Journal of Science and Technology of the Arts* 15, no. 1 (2023): 9–29, <https://doi.org/10.34632/jsta.2023.11850>.

1.4.2 Dance Theory: Context

It is important to preface the discussion of dance theory by noting that its very essence has been in dispute for as long it has been in the discourse. It is also crucial to state that while this discussion of dance theory centres primarily on literature pertaining to European and American dance, a growing body of research on its relationship to dance practices in Asia and Africa enriches and decentres the discussion from the predominant Euro-American perspective. Examples of this type of scholarship in Asia point to critical engagement with pre-colonial, colonial and post-colonial choreography and performance histories²⁶ or tensions between perceptions of tradition and modernity as they relate to the South Asian body.²⁷ Similarly in Africa, the challenge in maintaining the integrity of traditional dance styles alongside the drive towards contemporary forms constitute an example of this movement.²⁸ Dance theory, in its broadest terms, concerns the constituent elements and principles of the artform, as distinct from its practice. Unlike music or visual art which have stronger codified theoretical traditions through which works can be examined and understood, precisely what these are in dance form the matter of ongoing debate. Though an analysis of the multiplicity of reasons for this is beyond the scope of this research, there are two strands of discussion that underpin the logical basis of this work. The first strand concerns the dyadic interaction of theory and practice. Many practitioners, particularly those typically classified as modern and postmodern choreographers including Martha Graham, Merce Cunningham and Pina Bausch often resisted the idea of dance theory, citing its irrelevance to the act of dancing.²⁹ And yet, it cannot be discounted that so much of what they, and by extension, we, experience of dance has already been shaped by theory before the reflective process even begins.³⁰ In his attempt to detect a continuous discursive tradition between scholars of the discipline,

²⁶ Sudesh Mantillake, 'A Pedagogy of Decolonial Choreography: Reflections of A South Asian Dance Practitioner', *Journal of Dance Education* 0, no. 0 (2022): 1–6, <https://doi.org/10.1080/15290824.2022.2075554>.

²⁷ Pallabi Chakravorty, 'Dance in South Asia: New Approaches, Politics, and Aesthetics (Swarthmore College, Pennsylvania. March 2, 2002)', *Dance Research Journal* 34, no. 2 (2002): 121–24, <https://doi.org/10.1017/S0149767700006963>.

²⁸ Francis Nii-Yartey, 'Principles of African Choreography: Some Perspectives from Ghana', in *Contemporary Choreography*, 2nd ed. (Routledge, 2017); Mellitus N. Wanyama and Isaac Waswa Shitubi, 'Emergent Issues Regarding "African Traditional Dance" and "African Contemporary Dance": A Discourse on the Current Theory and Practice of "African Dance" Criticism and Choreography', *Journal of Emerging Trends in Educational Research and Policy Studies* 3, no. 4 (2012): 433–37, <https://doi.org/10.10520/EJC126558>.

²⁹ Tilden A. Russell, ed., *Dance Theory: Source Readings from Two Millennia of Western Dance*. (Oxford University Press, 2020), 9780190059767.

³⁰ Kent De Spain, 'Resisting Theory: The Dancing Body and American Scholarship', 2007, 59–64.

Tilden Russell argues that the difficulties arising in the theorisation of the artform stem directly from its essential constituent: human motion.³¹ He contends that dance, conceptualised as a unique, ephemeral manifestation of a “living, moving, present human body”³² presents a challenge in abstracting its principles from one’s own physical experience. In other words, the challenge of dance theory resides in the generation of a schema through the individual, experiential nature of physical movement. If, according to Russell, these are key conditions as to the “what” of dance, then the research questions in this investigation fall outside of its bounds as XR dance radically challenges notions of ephemerality, liveness, and presence.

Other theories of dance foreground expression as its central constituent. For Mary Wigman, it is a vehicle for the expression of the individual condition.³³ Susanne Langer, however, positions the origin of expression at a distance from the dancer.³⁴ More recent theorists including Pirkko Husemann³⁵ and Susan Foster³⁶ situate dance within a critical practice paradigm, shifting away from the binarity of body and mind that has historically plagued discussions of dance theory.³⁷ If “practice is the respective field-immanent *modus operandi* of the socialisation of the subject revealing itself in routine practices”,³⁸ then critical practice must exist in a particular relationship to something else. In this view, dance practice should not be differentiated from theory, but instead considered as a encompassing term referring to techniques and practices in the field of dance and its various subfields.³⁹ Even these few examples demonstrate how dance has been, and continues to be, theorised in a multitude of ways in order to carve it open and examine how it generates cultural and ideological meaning.

³¹ Russell, *Dance Theory*.

³² Russell, *Dance Theory*, xxii.

³³ *The Language of Dance*, The NEH/Mellon Open Book Program, Dance Titles – Open Access Ebooks. 8. (Wesleyan University Press, 1966), 10.

³⁴ 1956 in Roger Copeland and Marshall Cohen, *What Is Dance? Readings in Theory and Criticism* (Oxford University Press, 1983), 4.

³⁵ Pirkko Husemann, *Choreographie als kritische Praxis: Arbeitsweisen bei Xavier Le Roy und Thomas Lehmen* (transcript Verlag, 2009), <https://doi.org/10.14361/9783839409732>.

³⁶ *Corporealities: Dancing Knowledge, Culture and Power* (Routledge, 1996); *Dances That Describe Themselves: The Improvised Choreography of Richard Bull* (Wesleyan University Press, 2002).

³⁷ Gabriele Klein, ‘Dance Theory as a Practice of Critique’, *Revista Brasileira de Estudos Da Presença* 11, no. 1 (2021), <https://journals.openedition.org/rbep/1193>.

³⁸ Klein, ‘Dance Theory as a Practice of Critique’, 8.

³⁹ Klein, ‘Dance Theory as a Practice of Critique’.

1.4.3 Borrowing from Screendance

In moving towards a theoretical framework for XR dance, the potential extension of screendance is worthy of consideration. Though dance has always been part of the cinematic tradition, the shift towards screendance, defined here as work that affords equal weight to film and dance, as a prominent subfield of dance with its own practical and theoretical considerations is of interest in the present research. However, Douglas Rosenberg argues that this hybridity leaves screendance in “a critical vacuum out of which we align ourselves with the entertainment value of dance and the technical method of distribution of film and video”.⁴⁰ Equally, the clear logical challenges in applying any of the previous modes of theorising dance to screendance (for instance, Russell’s assertion that dance necessitates ephemerality and a “living and present human body”⁴¹) are obvious. If the central conditions of dance as they have previously been outlined cannot be met, then how can the questions of “what” and “why” through which the work is placed into conversation with other elements that generate cultural and creative meaning be addressed? Rosenberg proposes a series of new paradigms through which to think about screendance: these are “isolationist”, “directors”, “inertia”, and “what if”.⁴² These four paradigms position camera and director as co-creative agents who transform, rather than document, choreographic bodies and relationality through filmic mediation. Though encompassing a broad width of theoretical ground and seeming to whisper at it on several occasions, these paradigms cannot fully theorise body-technology relationships. Taking up some of the conceptual fragments scattered in Rosenberg’s proposal, Erin Brannigan argues, following André Bazin, Stephen Heath and Gilles Deleuze, that corporeal presence in screendance offers a new model of the dancing body.⁴³ It is created through the “cinematic machinations of light, dust, duration, and expanded filmic performance, including editing and camera distance/movement”⁴⁴ and is distinct from other cinematic bodies as a function of its production. This is to say that its

⁴⁰ ‘Proposing a Theory of Screendance’, paper presented at American Dance Festival, *Screendance: The State of the Art Proceedings*, 2006, 16, <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=fc44bb8e3c7762a1f02dab8f13de2e6d93642d46#page=16>.

⁴¹ Russell, *Dance Theory*, xxii.

⁴² Rosenberg, ‘Proposing a Theory of Screendance’. P.12-14

⁴³ *Dancefilm: Choreography and the Moving Image* (Oxford University Press, 2010).

⁴⁴ Brannigan, *Dancefilm*, 11.

genesis stems from the transformation of choreographic elements through the cinematic apparatus.⁴⁵

Extending this to the XR context, the mediation of the dancing body through motion capture technologies, 3D stereoscopic film, animation, and game engines is redefined, and requires an evolution of Brannigan's conceptualisation to account for hybrid embodiment, data extraction, and new choreographic modalities. As Kim Vincs notes, this creates creative and conceptual opportunities and raises a series of issues relating to the artistic and epistemological foundations of dance.⁴⁶

1.4.4 Challenges of XR – Choreography and Technology Entangled

In rendering choreography into data, technology has become “a means by which artistic representation of subjectivity and agency [...] can be abstracted, examined, and projected into new spatial, visual and conceptual contexts”.⁴⁷ This implies aesthetic considerations, but also questions of relationality, and within that, corporeality. Defined here as an “intertwining of sensation and perception where the body remains anchored as the central scope of awareness”,⁴⁸ its centrality as a site of reception in the dialogue between performer and technology, as well as performer and audience is paramount.⁴⁹ In practical terms, Hutchison and Vincs position the performer-technology relationship rather as “dance partners”,⁵⁰ and Ritter aligns the role of the audience in immersive performance in a similar way.⁵¹ It could be argued then, that choreography is itself a technology: a set of tools that facilitates a discursive exchange between digital technology, performer and audience. Philosopher Alva Noë argues that designed environments contain latent choreographic potential *and* condition it, though this is activated only under specific

⁴⁵ Brannigan, *Dancefilm*.

⁴⁶ Kim Vincs, ‘Virtualizing Dance’, in *The Oxford Handbook of Screendance Studies*, ed. Douglas Rosenberg (Oxford University Press, 2016), <https://doi.org/10.1093/oxfordhb/9780199981601.013.13>.

⁴⁷ Vincs, ‘Virtualizing Dance’, 264.

⁴⁸ Ann Cooper Albright, ‘Split Intimacies: Corporeality in Contemporary Theater and Dance’, in *The Oxford Handbook of Dance and Theater*, ed. Nadine George-Graves (Oxford University Press, 2015), 20, <https://doi.org/10.1093/oxfordhb/9780199917495.013.53>.

⁴⁹ I acknowledge here the intellectual lineage of phenomenology, specifically the contribution of Merleau-Ponty, which I explicitly address within the context of studio improvisation in chapter 4, but it does not constitute a significant theoretical lens within this research process.

⁵⁰ Stephanie Hutchison and Kim Vincs, ‘Dancing in Suits: A Performer’s Perspective on the Collaborative Exchange between Self, Body, Motion Capture, Animation and Audience.’, in *19th International Symposium on Electronic Art*, ed. K. Cleland et al. (ISEA International, 2013), <https://ses.library.usyd.edu.au/handle/2123/9739>.

⁵¹ Julia M. Ritter, *Tandem Dances: Choreographing Immersive Performance* (Oxford University Press, 2020).

conditions requiring coordinated bodily response – in what he terms “choreographic engineering”.⁵² Klein’s analysis of choreography within a historical understanding of the organisation of movement locates it as an aesthetic paradigm of social spaces and in the corporeal practices that the political activity of social movements is grounded in.⁵³ This adds a further dimension to the growing terrain of logical intersections, bringing the political underpinnings to the light. These two theories of movement organisation recognise choreography as distinct forms of organisational knowledge that operate through technological logics, holding the potential for disruption and reinforcement of control.

This technological vocabulary is picked up by Johannes Birringer, who creates a delineation between screen-based mediums and digital performance, noting that digital performance is “characterised by an interface structure and computational processes that are integral for composition, evolving content, aesthetic techniques, interactive configurations, and delivery forms”.⁵⁴ His notion of “post-choreography”,⁵⁵ where systems alter our control over creation, signals the need for posthuman frameworks that acknowledge technological agency. For Jacques Ellul, technology operates as mediation, not instrument.⁵⁶ This framing illuminates the relationship between bodies, spaces and cultural meaning, and Simondon’s process of concretization gives a technical object an intermediary place between the natural object and the scientific representation of the abstract.⁵⁷ Applying this to choreography offers a way to theorise the trajectory from embodied practice to technical object to new choreographic possibility, revealing choreography and technology as co-evolutionary rather than oppositional systems. This application aligns with Steigler’s work on temporality, in which he asserts that human presence is always mediated by technical objects that are themselves inorganic but carry

⁵² Alva Noë, ‘Newman’s Note, Entanglement, and the Demands of Choreography: Letter to a Choreographer’, in *Transmission in Motion: The Technologizing of Dance*, ed. Maaïke Bleeker (Routledge, 2017).

⁵³ Gabriele Klein, ‘Dancing Politics: Worldmaking in Dance and Choreography’, in *Emerging Bodies: The Performance of Worldmaking in Dance and Choreography*, vol. 21, ed. Gabriele Klein and Sandra Noeth, Critical Dance Studies (Transcript, 2011).

⁵⁴ Johannes Birringer, ‘Choreographic Performance Systems’, in *Contemporary Choreography: A Critical Reader*, Second edition, ed. Jo Butterworth and Liesbeth Wildschut (Routledge, 2018), 466.

⁵⁵ Johannes Birringer, ‘After Choreography’, *Performance Research* 13, no. 1 (2008): 118–22, <https://doi.org/10.1080/13528160802465649>.

⁵⁶ Jacques Ellul, *The Technological System*, trans. Joachim Neugroschel (Continuum, 1980).

⁵⁷ Gilbert Simondon, ‘Genesis of the Technical Object: The Process of Concretization’, in *Dispositif: A Cartography*, ed. Greg Bird and Giovanbattista Tusa (MIT Press, 2023).

traces of human activity.⁵⁸ In other words, in understanding the body to be constituted through and with technological systems, posthumanism offers a theoretical lens through which to reconceptualise the human.

1.4.5 Posthumanism and the Performing Body

Posthumanism, which is employed in this research following Braidotti, is a tool for reimagining the human subject within biotechnological systems.⁵⁹ It rejects the nature-culture continuum, which posits a categorical distinction between the given (nature) and the constructed (culture). This binary facilitates the study and critique of the social mechanisms that support the construction of identities, institutions, and practices, but posthuman theory resists this, proposing instead a non-dualistic understanding of the nature-culture interaction. It argues that these categorical boundaries have largely dissolved as a result of technological and scientific advances, and therefore a new, subjective theory that acknowledges our entanglement with material and relational contexts is key to the navigation of the complexities of contemporary existence.⁶⁰

Although it is positioned as a tool, much of posthuman theory offers little beyond a lens through which to critique and reimagine human subjectivity. Haraway's "polytemporal, polyspatial knottings" concept, however, in which different flows become temporarily coordinated through their ongoing relational processes, offers a framework for understanding the "knotting" process between (human) kinaesthetic flow and (non-human) computational temporality. It also offers a starting point from which to address the new conditions of temporality that XR choreography generates. In chapter 2, I synthesise these as hardware time, software time, network time, and experiential time and use the idea of "knottings" to extend Ritter's "proformers" concept in constituting a model of spectatorship that accounts for the situatedness of entities within multiple spatial and temporal flows and facilitates their interaction across space and time.

Amy Strahler Holzapfel's notion of "climatescape" offers a way to conceptualise the more-than-human spatial field, or "the fragile interconnectedness and interdependency between bodies and spaces, figures and grounds".⁶¹ Though her initial framing appears to

⁵⁸ Bernard Stiegler, *Technics and Time. 2, Disorientation* (Stanford, Calif. : Stanford University Press, 2009).

⁵⁹ Rosi Braidotti, *The Posthuman* (Polity Press, 2013).

⁶⁰ Braidotti, *The Posthuman*.

⁶¹ Amy Strahler Holzapfel, 'From Landscape to Climatescape in Contemporary Dance-Theater: Meredith Monk, The Wooster Group, and The TEAM', in *The Oxford Handbook of Dance and Theater*,

decentre the human focusing instead on a systemic whole, posthumanism, cannot, in any of the constitutions I have introduced, offer a processual, spatial-ontological framework for where or how more than human entanglements occur - just that they do. However, Strahler Holzapfel's focus on the spatial dimension functions as a springboard from which to engage with Plato's notion of "chora". "Chora" is described it as a third element which is neither the eidos, eternal and unchanging, nor the physical world. This third kind, or chora, "is the spacing which is the condition for everything to take place, for everything to be inscribed".⁶² In other words, the chora disrupts the eidos-physical binary by functioning as a dynamic, generative realm. It operates as a generative spatial condition through which existence is continually recontextualised. Drawing on this logic, I argue that when the body exists simultaneously across physical and virtual realities in extended reality (thus activating a site of entanglement), the body itself functions as a somatic chora. It becomes a space and a condition in which posthuman existence is continually inscribed and transformed. This reframing offers a spatial and ontological logic for understanding how embodiment operates in hybrid realities, and thus the posthuman body and the body as chora emerge as complementary, mutually reinforcing concepts.

1.4.6 Participatory Culture, Co-Creation and Agency

Having established the ontological condition of the posthuman performing body through XR technologies, it is necessary to examine the economic and political structures within which the body operates. The renegotiation of audience—artwork relationship finds useful footing in the term "co-creation", part of a developing lexicon of participatory art models. Its inclusion across both business and artistic spheres denotes a means of adding value to a process of creation, and it cannot be separated however from broader capitalist logics of value extraction and data commodification.⁶³ Brown and Novak-Leonard situate the term within the audience—artist paradigm, noting that the activity of co-creation requires a contribution from audience members to an artistic experience, curated by a professional artist.⁶⁴ Media scholar Henry Jenkins' term

ed. Nadine George-Graves (Oxford University Press, 2015), <https://doi.org/10.1093/oxfordhb/9780199917495.013.59>, 417.

⁶² Jacques Derrida and Peter Eisenman, *Chora L Works: Jacques Derrida and Peter Eisenman*, ed. Jeffrey Kipnis and Thomas Leiser (Monacelli Press, 1997), 10.

⁶³ Venkat Ramaswamy and Kerimcan Ozcan, *The Co-Creation Paradigm* (Stanford University Press, 2014); Bryan R. Rill and Matti M. Hämäläinen, *The Art of Co-Creation: A Guidebook for Practitioners* (Springer, 2018).

⁶⁴ Alan S. Brown et al., *Getting in on the Act: How Arts Groups Are Creating Opportunities for Active Participation* (The James Irvine Foundation and Wolfbrown, 2011).

“participatory culture” denotes a significant change in the levels of interaction and engagement between those who create and those who consume.⁶⁵ Taken in tandem with the continued expansion of co-creative practices in cultural spheres, it is from this environment that immersive performance has emerged. Critiquing this shift towards participation, Jen Harvie coined “prosumer”, denoting “combined producers and consumers who do for themselves what would formerly have been done for them [...] who fulfil their own needs by producing what they want to consume.”⁶⁶ She situates this type of work within a neoliberal framework and within a marketplace, arguing that it often offers illusions of power and agency, and rather than unshackling audiences from the cultural hierarchies that prioritise traditional spectator experiences, it numbs them to the ways in which they are enveloped and exploited by dominant economic forces.⁶⁷ And yet, Ritter argues, if we reframe the audience as spectator to audience as co-creator or “proformer”,⁶⁸ there is still space for authentic, agentive decision-making within the instructional, improvisational scores devised in these experiences. This tension between Harvie’s structural critique and Ritter’s experiential defence points to the complexity of this relationship under capitalism. Performances are productions, requiring the investment of capital and hiring of labour to create and sell a product with the expectation of profit generation.⁶⁹ Acknowledging the relationship between the social and economic relations of production, however, does not imply a directional relationship between the two – in fact as Fine argues:

There is no simple relation between production and the rest of the economy, mode of production or social formation [...] it would be a mistake to see Marx’s or Marxism’s understanding of production as being exclusively preoccupied with material production. At a general level it is concerned with the reproduction of the social formation as well as of the economy.⁷⁰

⁶⁵ Henry Jenkins, *Convergence Culture: Where Old and New Media Collide* (NYU Press, 2006), <https://www.jstor.org/stable/j.ctt9qffwr>.

⁶⁶ Harvie in Ritter, *Tandem Dances*, 84.

⁶⁷ Harvie in Ritter, *Tandem Dances*.

⁶⁸ Ritter, *Tandem Dances*, 85.

⁶⁹ Bruce McConachie, ‘Historicizing the Relations of Theatrical Production’, in *Critical Theory and Performance: Revised and Enlarged*, ed. Janelle Reinelt and Ann Arbor (University of Michigan Press, 2007).

⁷⁰ Fine in Ritter, *Tandem Dances*, 85.

From this, it is possible to understand theatrical productions as a locus for the perpetuation of social and economic ideology, policy, and strategies of governance. XR dance productions do not simply generate cultural products; they hold the capacity to reproduce inherent bias (particularly as it relates to movement vocabularies) and data ownership. When motion capture systems extract movement data, they enact and normalise specific relations of production where bodies become resources for computational capital.

1.4.7 Semiocapitalism

The emergence of semiocapitalism as a framework, characterised as the integration of the precarisation of labour under the conditions of neoliberalism and the increasingly media-saturated culture with its fixation on the realm of information, communication and discourse, affect atmosphere, desire and signs,⁷¹ provides a distillation of contemporary capitalism that is a useful lens through which to examine the type of labour relations under question in this research.⁷² It offers a novel way to consider ideas of ownership as they relate to dance data obtained during performance. For instance, a live motion capture performance generates a dual-audience model; this encompasses the physical audience in the room and the technology conglomerates harnessing the dance data in abstracted forms for later use. Corporations obtain data not for their own enjoyment, but in order to transform it into a resource for surplus value generation.⁷³ This new duality challenges traditional labour relations by obscuring the ownership of labour, as digital artifacts circulate beyond the control of the performing bodies that generate them.

These theories highlight the centrality of ephemerality and a living, present, body in dance; expression as an essential function; and the necessity for contextualisation within a broader social framework. Whilst each of these theories is fundamental to dance practice, individually, they cannot be considered to constitute its whole. Instead, this research regards them synergistically. When related to XR/digital dance culture however, their shortcomings include the incongruence of ephemerality, liveness, and presence in the digital realm;

⁷¹ Pepita Hesselberth, 'Creative Control: Digital Labour, Superimposition, Datafication, and the Image of Uncertainty', *Digital Creativity* 28, no. 4 (2017): 332–47, <https://doi.org/10.1080/14626268.2017.1378686>.

⁷² Compositionism is the lens used in the development of this framework. Other thinkers of note include Italian philosopher Paolo Virno, Antonio Negri and Maurizio Lazzarato, whose ideas were influential in the development of the concept of semiocapitalism.

⁷³ Karl Marx, 'Theories of Surplus Value', in *Marx & Engels: Collected Works.*, 32 : Marx 1861-63, ed. Larisa Miskievich (Lawrence & Wishart, 2010).

changing codes of expression; and an incomplete strategy for managing the emerging facets of ethical and social implication in this type of dance work.

Finally, the first and last consideration in constructing this framework has been of the centrality of the body in both politics and dance. In the context of this research, it is the nexus through which dance theory and practice, co-creation, and politics flow. The interplay of these elements is visible in that theory necessitates practice, a central tenet of which is co-creation, which sits in a social and political context.

1.5 Practice Methodology

1.5.1 Practice-as-Research: The Good, The Bad, The Disputed

This thesis does not attempt to construct an epistemological lineage of Practice-as-Research (PaR),⁷⁴ nor does it attempt to relitigate debates about its legitimacy. Instead, I define the specific understanding of PaR that structures this research. The work of “educator-researcher”⁷⁵ Robin Nelson, whose thirty-year advocacy for “innovative, investigative praxis”⁷⁶ as valid research grounds this understanding. For Nelson, PaR involves “a being-doing-thinking that can generate new knowing across a range of intra-disciplines and is entangled in an ethical dimension”.⁷⁷ This research crosses disciplinary terrain including dance and theatre studies, human-computer interaction (HCI), critical theory, philosophy, ethics and computer science. It requires a methodology through which the disciplinary boundaries become nebulous, and, as I argue later, that dispels with the Cartesian mind-body dualism implied within traditional Western research frameworks. Nelson argues for “practice” as a mode of thinking, stating that:

My use of “practice” in this context, then, denotes research undertaken not primarily nor exclusively through the cognitive processes (thought, reason, intellect) with findings published in words which typify the Western intellectual research tradition, but through “doing”—activities which start perhaps in experience, perception, awareness, play, crafting but which are not devoid of

⁷⁴ See for instance Henk Borgdorff et al., eds, *Dialogues between Artistic Research and Science and Technology Studies*, Routledge Advances in Art and Visual Studies (Routledge, Taylor & Francis group, 2020), <https://doi.org/10.4324/9780429438875>; Robin Nelson, *Practice as Research in the Arts (and Beyond): Principles, Processes, Contexts, Achievements* (Springer International Publishing, 2022), <https://doi.org/10.1007/978-3-030-90542-2>.

⁷⁵ Nelson, *Practice as Research in the Arts (and Beyond)*, 7.

⁷⁶ Ibid.

⁷⁷ Ibid, 19.

thought...in the use of my preferred term “praxis” (being-doing-thinking), I refuse the binary distinction between “theory” and “practice” as traditionally made in the acad-
emy. Indeed, in a core intra-relation of onto-epistemology, I hold that all thinking is embodied and embodiment is, to greater or lesser extents, mindful.⁷⁸

This refusal of mind-body dualism resonates with, Borgdorf, Peters & Pinch, who argue for a growing proximity between artistic research and science and technology studies (STS) at the level of knowledge production, research methods and outcomes. In their assessment, artistic research and STS “share the project of enlarging their methodological repertoires, as well as the reflection on the politics of “the material heterogeneities of knowing””.⁷⁹ In other words, both fields engage in methodological experimentation alongside maintaining a critical attention to how knowledge production is materially enacted through diverse, situated practices. This convergence provides a logical basis for the research approach. Its questions, concerning compositional methodologies, embodied conditions and ethical frameworks, require investigation through making, not through post-hoc performance analysis of completed work. Performance analysis cannot account for the ontological and ethical insights that emerge during the making process. PaR therefore moves beyond performance analysis, positioning choreographic process as a distinct epistemology, generating knowledge through sustained encounters between performing bodies, motion capture technologies, and virtual and augmented reality systems in the studio. This process fulfils Nelson’s formulation of the primary purpose of research, which he states is “to produce new insights effectively shared”,⁸⁰ with the creative artifact operating as the “basis of the contribution to knowledge”.⁸¹

PaR is not, however, without its challenges. For one, its unique capacity to operate between, within and across disciplines can lead to “conceptual slippages and indeterminacy”,⁸² the fact of which can be exploited by those who continue to perpetuate the mind-body binary within research agendas. Similarly, because PaR is

⁷⁸ Ibid, 20.

⁷⁹ Borgdorff et al., *Dialogues between Artistic Research and Science and Technology Studies*, 7.

⁸⁰ Nelson, *Practice as Research in the Arts (and Beyond)*, 25.

⁸¹ R. Lyle Skains, ‘Creative Practice as Research: Discourse on Methodology’, *Media Practice and Education* 19, no. 1 (2018): 82–97, <https://doi.org/10.1080/14682753.2017.1362175>, 86.

⁸² Nelson, *Practice as Research in the Arts (and Beyond)*, 11.

methodologically pluralistic,⁸³ Borgdorf, Peters and Pinch argue that “in academia, taking art to be a form of doing research and presenting the works of art that result from that research as a form of knowledge is criticized as conflicting with standards of intersubjectivity, detachment, and justification”.⁸⁴ This concern is compounded by the frequency with which artistic researchers apply reflective analysis to their practice. If conducted after the creative act rather than during, this method becomes reliant on memory and often fails to offer insights into the cognitive processes that are core to knowledge generation through PaR and of course, becomes fallible.⁸⁵ To counter this, Skain proposes the integration of a “self-directed form of ethnomethodology”⁸⁶ within the PaR framework. This involves the use of a contemporaneous research log composed of insights, process, difficulties, draft material, and revision notes, which, when taken together with the finished creative artifact offer a means of integrating analytical process and product in a manner that offsets limitations of reflective analysis and self-observation.⁸⁷

A further challenge arises in the tension between the professional art world and academia. Although for many artists the academy is an entry point to a professional career, there is often a divergence in the locus of value between the two. For the professional world, value lies in the creative output; for the academy, value is weighted towards knowledge generation through the interrogation of creative process and artifact, theoretical positioning, and synthesis. When theatre and performance artist Bogdan Szyber’s PhD thesis was unanimously rejected by Stockholm University of the Arts in 2020 for insufficient artistic analysis and synthesis, he coined the term “edu-art”, or Educational Art, to describe artistic research outputs. Further, he argued for its irrelevance to the professional art sector, noting that it “appears to have a little or no impact in the in the field of art in general.”⁸⁸ I disagree - as a professional artist, my artistic research and professional practice are inseparably entangled. In other words, I

⁸³ See for instance Brad Haseman, ‘A Manifesto for Performative Research’, *Media International Australia* 118, no. 1 (2006): 98–106, <https://doi.org/10.1177/1329878X0611800113>; or Jane M. Bacon and Vida L. Midgelow, ‘Creative Articulations Process (CAP)’, *Choreographic Practices* 5, no. 1 (2014): 7–31, https://doi.org/10.1386/chor.5.1.7_1.

⁸⁴ Borgdorff et al., *Dialogues between Artistic Research and Science and Technology Studies*, 2.

⁸⁵ Skains, ‘Creative Practice as Research’.

⁸⁶ Ibid, 87.

⁸⁷ Ibid.

⁸⁸ Robert Stasinski, ‘Criticised Artistic Research, Didn’t Pass the Viva’, *Kunstkritikk*, 30 June 2020, <https://kunstkritikk.com/criticised-artistic-research-didnt-pass-the-viva/>.

carry with me the embodied and theoretical knowledge generated during the research process into professional practice, even when there is no explicit research agenda. The tension that has arisen throughout the course of this research project actually operates in the other direction: research requires tacking back and forth between the personal and the contextual – refining, reorientating, and restarting. In her edited volume *Performing Process*, Emma Meehan’s analysis on the work of Sandra Reeve observes that while Reeve “hone[s] in on detail of [her] own experiences, at the same time [she is] concentrating on moving between [her] position and wider fields of practice and theory”.⁸⁹ This dyadic interaction is constantly in flux, at times demanding closer attention to the personal, at times to the contextual. In practice, I have sometimes felt deeply unsatisfied with my creative artifacts. The experimental agenda limited their aesthetic qualities, either through quick, rudimentary technological modelling, or because answering the research question took priority over aesthetic refinement. Of course, like all research processes, these have been time bound. The urge to spend time rehearsing the work as if it were to be staged is challenged by the researcher, who has a clear ontological mission and to whom time is more valuably spent testing multiple routes to a final form. For instance, there is a moment in *The Front* where the performer offers various audience members the opportunity to engage, through the offer of a simple twirl. Its final form was reached after an iterative process designed to bring the presence of the audience into the digitally rendered scenography. The prioritisation of the ontological enquiry over aesthetic refinement did not satisfy the part of the artist in me that stages professional work within a specific aesthetic tradition. Each work required its own specific adaptation of the integrated framework I detail below, attending to the dimension of the inquiry that is most relevant within and managing the tensions as they arose.

While each chapter details its own methodology, the overarching methodological structure consists of a specific choreographic framework, developed by Butterworth, and a version of Skain’s ethnomethodology. It considers both relational ethics (including whose dance vocabularies are valued, racial components, power dynamics) and situational ethics (responding to unpredictable, subtle but important moments that arise during a process). These considerations sometimes extend procedural ethics, including, for instance, attribution for development processes that include improvisation and co-

⁸⁹ Emma Meehan, *Performing Process: Sharing Dance and Choreographic Practice*, 1st ed, with Hetty Blades (Intellect Books, 2018), 124.

creation.⁹⁰ Forming the foundation of the framework I develop in chapter 3, these ethical dimensions were integrated throughout the studio practice and decision-making processes detailed in the individual chapter methodologies. Further, an application to the university ethics board via its system, REAMS, was made for each work that was developed at TCD.

1.5.2 Choreographic Framework

In her 2012 book, *Dance Studies: The Basics*, dance researcher and educator Jo Butterworth articulates an eight-stage choreographic process, which is perhaps the most comprehensive choreographic framework within the dance studies domain.⁹¹ A brief overview follows:

- Stage 1: Stimulus/Conception/Intention – during this stage, the aim, context and starting points for the work are determined.
- Stage 2: Dance Content: The Generation of Language – here, the movement vocabulary starts to find its shape, either through improvisation or as set material.
- Stage 3: Processes and Modes of Making – often, the choreographer sits at the apex of the power vortex and carries most of the decision-making responsibilities. Butterworth's Didactic-Democratic model however identifies a series of five different artistic-social processes that can be used during a creative process.⁹²
- Stage 4: Dance Content Development – this stage usually involves shaping movement material through the development, orchestration and manipulation of material generated in stage 2.
- Stage 5: Structuring and Forming the Dance – considering the construction of the work, from macro and micro perspectives through questions including logical structure and inter-relatedness.
- Stage 6: Completion/Rehearsal/Performance – this phase concerns ensuring the coherence of the choreographic elements, rehearsing enough to give performers intention and confidence, and finally performing the work in front of an audience.
- Stage 7: Evaluation/Reflection – a critical analysis of the process and product.

⁹⁰ Rosemary Candelario and Matthew Henley, *Dance Research Methodologies: Ethics, Orientations, and Practices*, 1st edn (Routledge, 2023), <https://doi.org/10.4324/9781003145615>.

⁹¹ Jo Butterworth, *Dance Studies: The Basics*, (Routledge, 2012), <https://doi.org/10.4324/9780203156995>.

⁹² See Jo Butterworth, 'Too Many Cooks? A Framework for Dance Making and Devising', in *Contemporary Choreography: A Critical Reader*, Second edition, ed. Jo Butterworth and Liesbeth Wildschut (Routledge, 2018) for further details.

Crucially, Butterworth notes that “the stages might not come consecutively, one after another; there might be slippage between them, as when you develop a phrase in many different ways, only to throw it away and start again”.⁹³ This mirrors my own process: in general, stage 3 came alongside stage 1, and at times, stage 4 and 5 were interchangeable. To return once again to *The Front*, the spatial structuring was developed far in advance of any movement generation but was altered in response to the movement language that emerged through improvisation in the studio. What Butterworth’s model fails to account for is the explicit integration of what Skain describes as an ethnomethodology. As a result, following Skain, I integrated the use of contemporaneous note-taking both in written format and through photographs and video. Further, I composed études for several of the works (specifically for *Art.i.Fact* - motion capture studies and *Untitled* -a film study) which functioned as draft materials that capture specific processual thinking. The use of a multi-faceted methodological structure provided a depth of insight into the development of each specific work, limiting the reliance on memory and acknowledging the flux and dynamic space inhabited during a creative process.

1.6 Research Positioning

My work, as a locus of methodological experimentation and technological interrogation, continues a long legacy of unconventional, non-commercial creative practice. My own positionality, as a white woman from a working-class background in an English-speaking, Western institution, is important to my capacity to continue this work. Whilst only one of my parents finished school and neither have a university education, I have benefitted from an education system that is essentially free, a political system that, despite many flaws, values and funds the arts,⁹⁴ and an institution that holds space for creative research. These facts are increasingly important when considering that many innovative technologies, including those used throughout this research, are inaccessible to artists operating outside of these conditions. Thus, the challenges, concerns and insights drawn through this project may not reflect those of artists whose privilege does not equal mine. In July 2025, the British Council authored a report entitled “Why technology needs artists: 40

⁹³ Butterworth, *Dance Studies*, 62.

⁹⁴ Though there is much to say on whether the arts in Ireland are in fact valued highly enough given the annual percentage of GDP that is allocated to its funding bodies, it is at least true to say that there is a relatively significant infrastructure to support the sector.

international perspectives”,⁹⁵ which argues, through the use of multiple case studies, including from artists and industry leaders that “artists are of immense value as technology rapidly and radically transforms our world...artist-led innovation also reorients technologies towards people, resists bias, prioritises sustainability, creates public engagement, and decentralises the tools that are transforming our world”.⁹⁶ Whilst this is plausible, there is much to critique in the systems from which the technologies under question emerge, and in the systems that uphold limited access for those whose race, gender or socioeconomic status does not grant them automatic access. The assertion that “artists aren’t afraid to challenge, break and redevelop technologies”⁹⁷ assumes a position of physical and political safety; it seems unreasonable to suggest that Palestinian citizens, or perhaps South American immigrants in the United States, or Iranian artists, can operate with the freedom that is required to do this. In fact, through methods including algorithmic training, these technologies also hold the potential to perpetuate oppressive political or social regimes. Although they may possess the creative and intellectual tools to challenge inequities embedded within technological structures, it cannot be the sole responsibility of artists to do so, and it must include the marginalised.

This research therefore proceeds with reflexive awareness of its situatedness. I do not claim that my insights are universally applicable, nor that all artists can or should engage with technologies in the ways I do. Rather, I position this work as a situated investigation that acknowledges the privilege enabling it while attempting to generate methodological, ontological, and ethical insights that might inform more equitable technological practices in performance. The ethical framework proposal developed here, particularly around bodily data, consent, and collaborative agency, emerge from my capacity to refuse extractive logics without personal or professional jeopardy. This privilege carries a responsibility: to articulate not only what choreographic practice reveals about immersive technologies, but also the conditions that enable such interrogation, and to advocate for democratising those conditions.

⁹⁵ Hannah Andrews and Aurora Hawcroft, ‘Why Technology Needs Artists: 40 International Perspectives’, ed. Aremu Anuoluwapo et al., preprint, British Council, 2025, application/pdf, <https://doi.org/10.57884/Z34F-0732>.

⁹⁶ Andrews and Hawcroft, ‘Why Technology Needs Artists’, 5.26/05/2026 09:56:00

⁹⁷ Ibid, 12.

1.7 Chapter Summaries

Chapter 2:

Using *Art.i.Fact* and *Traversing Spaces* as its primary objects⁹⁸ of analysis, this chapter addresses RQ1 by examining the means through which choreographic practice, encompassing language and performative relationships, is reformulated through its interaction with immersive technology. It specifically engages with motion capture systems including Vicon, an optical system housed in the computer science department at TCD, software systems including Unity and Neos, and Oculus Quest VR headsets. Through practice, it illuminates a fundamental reshaping of key organising principles of time and space. It constructs temporal layers in mixed reality choreography as hardware time, software time, network time and experiential time. This contributes a new temporal architecture involving multiple, overlapping temporalities, converging at different ontological levels. It also reveals that mocap technologies can struggle to quantify the parts of dance movement that stretch beyond the mathematical logic that underpins the system, including the unquantifiable, expressive elements and kinetic energy transfer between performer and audience.

Chapter 3:

Addressing RQ2 in the second chapter, *Untitled* provides fertile ground for an investigation of the modes through which choreographic and scenographic systems can set the conditions for the emergence of a performative model of posthuman embodiment. It charts the development of the work through three phases. Phase one involved conceptualisation and spatial testing using Resonite, a real-time worldbuilding software and an HTC Valve Index VR headset. Phase two offered a filmic étude, examining the body both in space and as space, and playing with the deconstruction and reconstruction of its form. Phase three built on these processes by constructing a “climatescape” in studio, through which the performing body encounters and navigates a hybrid reality. It utilised a physical architecture, alongside an Oculus Quest Pro and a Microsoft Kinect motion sensing device. Through this process, we come to understand that when disrupted by technology, the body schema functions as a porous membrane; as both landscape and navigator, simultaneously constructing and traversing physical and virtual terrains. In framing the posthuman

⁹⁸ Objects here refers to creative artifact *and* process.

performing body as a somatic chora, I offer an ontology of posthumanism that facilitates practice-based engagement.

Chapter 4:

Through documentation and analysis of *The Front*, this chapter maps the relationship between choreographic strategies, performative modes and the corporate governance frameworks that underpin the relationship between performer and performance and reveal the subtle ways in which the performance technology exerts its own agency on the live work. It primarily addresses RQ3. This reflective piece charts the conversation between maker and technology, observing the nuances in the relationship throughout the creative process. It considers context from which each individual network, software system and plug-in emerges, exploring the interaction of the various sets of policies and methodologies as they relate to the data produced from a live performative body. It attends to questions of consent: to whom does dance data belong as it passes from live body through networked platforms and technologies, to its ultimate realisation in performance? How is it mediated along this pathway, and how can I, as a choreographer, engage with an ethical framework to ensure that the performing body does not become a site of extraction? It concludes by proposing a practitioner-led framework for the use of immersive technology in performance practices.

Chapter 5:

The interconnections and new ontology established through practice-as-research investigations are synthesised in this concluding chapter by mapping insights onto current legal and best practice frameworks as they pertain to immersive technologies in performance. The analysis positions new learnings alongside, or sometimes contrary to, established best-practice guidance as outlined by the performing arts and entertainment trade union, Equity,⁹⁹ which operates on behalf of over 50,000 performers and creative practitioners in the UK and Ireland.¹⁰⁰¹⁰¹ Equity positions its guidance for working with motion capture and performance capture technologies within the video game sector,

⁹⁹ This analysis will also reference and analyse some relevant SAG-AFTRA guidelines, but US labour relations and legal frameworks differ significantly to European contexts. For this reason, engagement is limited.

¹⁰⁰ 'About Us', Equity, accessed 6 February 2026, <https://www.equity.org.uk/about-us>.

¹⁰¹ Though Equity is a British union, Irish Equity and UK Equity have committed to working together for the harmonisation of contracts across borders.

though this is clearly inadequate given the continued rise in its usage in live performance. Hence, this chapter seeks to further unpack the growing need for thoughtful, practice-informed ethical frameworks that push beyond the legal imperatives of labour union negotiations and propose an extension and reapplication of Equity best-practice policies to address the needs of this specific sector.

1.8 Communities of Practice and Contributions to Knowledge

To return briefly to my opening image, suspended upside down and caught between worlds, the contributions to knowledge of this research project can be articulated on three levels: choreographic methodology, hybrid performing body theorisation, and industry governance. The notion of being between worlds is particularly resonant when considering the communities of practice for this research – it seems reasonable to suggest that this community is not yet fully consolidated, but that its constituent parts are identifiable. One of the central contentions of this research is that its consolidation is urgently required in addressing not only the new conditions of performance, but the evolving institutions within which practice and research (and practice-as-research) are taking place. It speaks not only to the dance community – artists working across XR technologies, including for instance Gibson/Martelli, Alexander Whitley or AΦE Aoi + Esteban – but to interdisciplinary research projects working at the intersection of performance and computer science. Projects of this nature include Motion Bank, a research project established by William Forsythe in 2010, now based at Mainz University of Applied Sciences, whose research focus is on digital dance research, the digital documentation of dance, and the use of digital technologies in dance practice.¹⁰² Similarly, Immersive Arts Space at Zurich University of the Arts, which engages disciplines from computer science, to performance studies, to sociological inquiry, in developing critical approaches to art and design and technology through their bi-directional engagement also forms part of this ecosystem.¹⁰³ To these communities, it offers a methodological contribution through the integration of two distinct practice frameworks that capture choreographic thinking alongside reflective and theoretical insights during the process. It also contributes a temporal architecture for constructing

¹⁰² 'Motion Bank', accessed 14 May 2026, <https://motionbank.org/>.

¹⁰³ *Immersive Arts Space | Zurich University of the Arts*, n.d., accessed 14 May 2026, <https://blog.zhdk.ch/immersivearts/>.

and analysing dance in immersive contexts, and proposes polyspatial, polytemporal knotting patterns as a mechanism for understanding the relational experience of immersive choreography. The research also generates a novel ontological conceptualisation of the posthuman performing body through its somatic chora theory, and charts its emergence through practice.

The project's community of practice also extends to HCI and performance scholars working on ethical frameworks and processes for immersive media. The work converses with existing research, including for example Sparrow et al.'s BEAP framework, which offers a scoping review of HCI, performing arts, and social sciences research related to the use of biometric data in immersive biometric performance and offers a framework of ethical considerations for artists and researchers working in the space.¹⁰⁴ Finally, it engages governance of the performing arts industry through situating and offering proposals for the extension of ethical frameworks in considering hybrid bodies and data in performance. The research achieves this through an analysis and critique of existing labour union policy frameworks, including Equity and SAG-AFTRA, whose guidance has been principally developed for the games and screen industry and inadequately extended for live performance contexts. As the first half of the research project was physically situated in the School of Computer Science at TCD, the circulation of technical and HCI knowledge and dialogue was extended beyond journals or conferences, emerging through in-studio and informal interdisciplinary dialogue.

These contributions emerged from the same source: a body encountering systems that carry their own embedded assumptions about how it should move, where it should be, and what all of this might mean. What follows articulates and analyses just how these curiosities can be probed through practice, and how these findings operate as an interlocutor between worlds.

¹⁰⁴ Lucy A. Sparrow et al., 'Heart and Soul: The Ethics of Biometric Capture in Immersive Artistic Performance', *Proceedings of the CHI Conference on Human Factors in Computing Systems*, 11 May 2024, 1–23, <https://doi.org/10.1145/3613904.3642309>.

Chapter 2. Dance Praxis, Choreographic Strategies and Structures of Technology

2.1 Introduction

This chapter explores the interaction of technology and choreographic practice through the analysis of two exploratory works; *Art.i.Fact* (2022), a virtual reality (VR) dance experience developed alongside composer Mauricio Flores Vargas and computer scientist Donal Egan. This interdisciplinary collaboration fed the choreographic process and generated a three-minute VR dance piece, which was exhibited at European Research Night at the Science Gallery (Dublin), Furthr Fest, an industry-focused emerging technology event held at The Convention Centre (Dublin), and most recently at The Lab Gallery (Dublin) as part of Dublin Tech week. This helped to broaden the audience base for the work and facilitated an iterative creative process, building on feedback from different audiences. The second work to be considered and discussed is *Traversing Spaces* (2023), a mixed-reality work developed at Prague Quadrennial. It was created in collaboration with scenographer Tania X, and a work-in-progress showing took place at H40 in Prague. Though these works are vastly different in their choreographic and aesthetic concerns and creative methodology, there is a continuity within the intellectual and artistic framework used to address the underlying research questions. Both works situate a performative relationship at their core and seek to examine how the language of contemporary dance can be extended beyond its established parameters. Critical reflection on the development and outcomes of both works will explore these components in relation to the theoretical frameworks established below. It will utilise a fluid approach to the description of and reflection upon both works, switching between the two in order to demonstrate the learnings and subsequent development of practice. This section will also draw on choreographic learnings from *The Front* (2023) and *Untitled* (2024), though their primary sites of analysis will remain in chapters 3 and 4. It should be noted that the types of technology under consideration here are limited. In part, this is due to the rapid technological advances during the tenure of this PhD – for instance, generative artificial intelligence (genAI) has seen an explosion not only in its development, but in its proliferation across developed societies since 2022, marked by the release of Open AI's

ChatGPT in November 2022.¹⁰⁵¹⁰⁶ As a result, the capacity to include it in a meaningful way in these investigations was limited, and after an intensive art–technology residency in Paris with the SPACE programme in July 2024, during which the focus was on the incorporation of gen AI tools into my practice, the decision was taken to omit this particular technology from my doctoral research. Its emergence as a choreographic tool however can be seen in programmes such as “ChoreoCraft, the first VR choreography crafting supportive tool”,¹⁰⁷ which essentially uses GenAI to provide feedback and suggestions to choreographers across various genres. What is notable is that this research does not address any of the underlying philosophical or ethical issues that underpin the system. For instance, what data is the AI being trained on? Has it been obtained ethically? How is it being protected? And who gets to decide what constitutes dance worthy of inclusion in these systems? In a way, this issue is a continuation of historical curatorial practices in dance, but instead of creative directors and curators of venues, festivals and funding bodies making these decisions, it is now often engineers and computer scientists. Considering an AI model that could create hip-hop, Sicchio notes that the database used to train it and subsequently generate this African diasporic form was entirely obtained from Japan, encoding a Japanese interpretation as an authentic expression of this style.¹⁰⁸¹⁰⁹

Access and technological expertise (and sometimes access *to* technological expertise) also informed the exclusion criteria. Finally, the technological choices I made were in the interest of my own aesthetic and creative curiosities; for instance, humanoid avatars and facial capture technologies were not of interest in these works, simply because I found no creative curiosity in this area. The primary digital technologies used in

¹⁰⁵ OpenAI, ‘Introducing ChatGPT’, 30 November 2022, <https://openai.com/index/chatgpt/>.

¹⁰⁶ This is not to say that AI was not used in these works; new motion capture systems such as Move AI or RADICAL use deep learning framework/neural networks that detect and calculate human 3D joint rotations over time from video footage.

¹⁰⁷ Hyunyoung Han et al., ‘ChoreoCraft: In-Situ Crafting of Choreography in Virtual Reality through Creativity Support Tool’, *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems* (New York, NY, USA), CHI ’25, 25 April 2025, 1–21, <https://doi.org/10.1145/3706598.3714220>, np.

¹⁰⁸ Sicchio in Lauren Wingenroth, ‘How Are Dance Artists Using AI—and What Could the Technology Mean for the Industry?’, *Dance Magazine*, 24 July 2023, <https://dancemagazine.com/how-dancers-use-ai/>.

¹⁰⁹ This is not to decry Japanese hip-hop as simply inauthentic; rather, it illustrates how technical gatekeepers now exercise curatorial power previously held by cultural institutions, determining whose cultural knowledge and identity get encoded as authentic. This is of particular importance when the form emerges from a culture that has been subjugated.

these works include motion capture, augmented reality and virtual reality. All of these are umbrella terms; this is to say that there are various hardware and software that execute the functions of these ideas. Their interaction with dancemaking, and more specifically, with contemporary choreographic practice, is the object of this chapter. It should be noted that much of the existing research in this area originates in the field of human-computer interaction (HCI), which positions its findings in terms of technological innovation or solutions, emerging through its application to human-centred, ergonomic principles, in this case in the context of choreography and dance. In their twenty-year retrospective on the intersection of these two fields, Zhou et al. distil the interest of the third wave HCI community in dance as follows:

As an interactive experience, the uniqueness of dance lies in its tight coupling with the body as the main interface through which expressive movements are conveyed. The kinaesthetic creativity of the choreographers, the lived experience of the dancers on stage, and the embodied perception of the audience, collectively makes dance an interactive experience.¹¹⁰¹¹¹

From this perspective, dance clearly offers a unique set of conditions through which technology is both challenged and evolved. What is less clear however, is how the other side of this bilateral relationship is impacted. What I am proposing is to invert the attentional weighting of this relationship. Whilst continuing to engage with technological innovations emerging from practice, this chapter is more concerned with the *choreographic* innovations and solutions that are necessitated when technology is inserted into the creative process. Additionally, as media theorist and practice-based researcher Daniel Strutt notes,

..there is arguably a need for a solid theoretical and conceptual framing for these collaborations between the dance and tech worlds. These are practices which are often under-theorised in terms of meaningful insights from the humanities, and this lack of insight into philosophical, cultural, or historical concepts can lead to work that is

¹¹⁰ Qiushi Zhou et al., ‘Dance and Choreography in HCI: A Two-Decade Retrospective’, *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, 6 May 2021, np, <https://doi.org/10.1145/3411764.3445804>. Note the use of language such as “interface” and “interactive”, both of which are deeply entrenched in the HCI community rather than, say, dance studies or performance studies.

¹¹¹ Third wave HCI cites influences including Heidegger and Merleau-Ponty in its shift of focus towards recognising the body as a locus for our perception, experience and expression within our situated world, and the merit of understanding this as a critical element of cognition.

technologically gimmicky, superficial, and uncomfortably “tagged-on” to existing practices.¹¹²

All of this to say that the following chapter aims to synthesise and contextualise in-studio research from the choreographic perspective, and to offer insights into how its findings might reshape both practice and theory. It is important to note that I resist the word “tool” as it is applied to technology, i.e. “technological tools”. This is simply because it connotes utility or functionality; a means to an end, and obscures the increasingly profound relationship that we, as beings of practice, community and society, are fostering with it.¹¹³

2.2 Choreography - Technology

The etymology of the word “technology” is a useful starting point in this consideration of its relationship to and with choreography. The ancient Greeks had the word “techne”, meaning skill in the arts. Aristotle discussed the term in the *Nicomachean Ethics*, asserting that “the business of every art is to bring something into existence”.¹¹⁴ Strands of both Roman and Arabic thought also support this understanding of the term, for example by presenting the crafts as practical sciences and applying mathematics, or acknowledging the richness of human intellectual capacity through the synthesis of arts and skills in the pursuit of both necessity and enjoyment.¹¹⁵ Later, the term “technology” or “technologie”, referred to “a discourse or treatise on an art or arts; *esp* (in later use) a treatise on a practical art or craft”.¹¹⁶ It is not until the late eighteenth century that its use came to be associated with the field of study dealing with the mechanical arts and applied sciences, and its application to the domain of fine art begins to recede. Though it is not my assertion that the industrial revolution was the catalyst for this recalibration, it is true that this period fundamentally transformed how the relationship between knowledge and

¹¹² Daniel Strutt, ‘Motion Capture and the Digital Dance Aesthetic: Using Inertial Sensor Motion Tracking for Devising and Producing Contemporary Dance Performance’, in *Dance Data, Cognition, and Multimodal Communication*, ed. Carla Fernandes et al., Routledge Advances in Theatre and Performance Studies (Routledge, 2023), 132.

¹¹³ This is not a new argument; Since Heidegger, there is a robust argument against the instrumental account that understand technology as fundamentally the essences of what it means to be human and any attempt to binarise it against the human is to misunderstand the ontology of humans.

¹¹⁴ Aristotle in David Edwin Nye, *Technology Matters: Questions to Live With* (MIT Press, 2006), 7.

¹¹⁵ Nye, *Technology Matters*.

¹¹⁶ ‘Technology, n. Meanings, Etymology and More | Oxford English Dictionary’, accessed 7 February 2026, https://www.oed.com/dictionary/technology_n.

practical application was conceptualised.¹¹⁷ In contextualising the somewhat unstable nature of the term, Nye contends that:

The fundamental misconception remains that practical discoveries emerge from pure science and that technology is merely a working out or an application of scientific principles. In fact, for most of human history technology came first; theory came along later and tried to make sense of practical results.¹¹⁸

Nye's challenge to a deeply ingrained modern assumption about the linear relationship between science and technology underscores its slippery nature and reveals that current assumptions about what counts as technology are historically contingent, not natural categories. Its meaning has become only hazier in contemporary usage, denoting a "comprehensive term for complex systems of machines and techniques".¹¹⁹ This definitional instability, however, is not a limitation but a theoretical opportunity.

To consider that choreography employs technological logics initially seems counterintuitive within dominant Western disciplinary boundaries. However, this apparent incongruity dissolves when we recognise that the contemporary penchant to divorce art and technology is a fallacy. Their shared commitment to experimentation and the selection and manipulation of matter, bounded by time, knowledge, funding and the materials available in the moment of making begins to foreshadow a resonance, practically, philosophically and conceptually.¹²⁰ If, in the Aristotelian sense, we imagine choreography as a schema for bringing dance into existence, or indeed choreography as the business of reasoning through dance as Anna Pakes argues,¹²¹ its relationship to the ancient Greek meaning of "techne" becomes apparent, igniting a series of interwoven trajectories and curiosities. Even contemporary understandings of technology, as flawed as they may be, share some commonalities with conceptualisations of choreography. As philosopher Alva Noë outlines, "...as we have already noticed, we human beings are

¹¹⁷ Barbara Hahn, ed., 'Technology in the Industrial Revolution', in *Technology in the Industrial Revolution*, New Approaches to the History of Science and Medicine (Cambridge University Press, 2020), <https://www.cambridge.org/core/books/technology-in-the-industrial-revolution/technology-in-the-industrial-revolution/DA180CE1CBDF711D1819E871545CDEB3>.26/05/2026 09:56:00

¹¹⁸ Nye, *Technology Matters*, 9.

¹¹⁹ Ibid, 15

¹²⁰ Ibid.

¹²¹ Anna Pakes, 'Knowing through Dance-Making: Choreography, Practical Knowledge and Practice-as-Research', in *Contemporary Choreography: A Critical Reader*, Second edition, ed. Jo Butterworth and Liesbeth Wildschut (Routledge, 2018).

organized, by habit and body schema and learning and nature, by our environments”.¹²² The idea that choreography is tied to organisation is relatively commonplace, and yet the understanding that objects and environments condition our movement implies that design, in whatever format, from architecture to political systems to manufacturing, operates through choreographic principles as a sort of “choreographic engineering”.¹²³¹²⁴ In other words, designed environments both contain latent choreographic potential and condition it, though this only becomes activated under specific conditions requiring coordinated bodily response. Though Noë is not referring directly to technology in its conventional sense, his use of the term “engineering”, denoting the systematic application of science to the optimum conversion of the resources of nature to the uses of humankind,¹²⁵ is notable. Technology and engineering in modern society are so deeply interconnected as to be inseparable, though not interchangeable. Thus, positioning choreography as engineering necessarily locates it within technological rather than purely artistic discourse and offers an opportunity to define where their logics intersect.

To further this argument a little, dance theorist Gabriele Klein firmly locates choreography within a historical understanding of the organisation of movement, and as an aesthetic paradigm of social spaces.¹²⁶ Though he rejects the notion of choreography as explicitly political, he notes that the political activity of social movements “..were and are above all grounded in corporeal practices”.¹²⁷ Though this fact is little noted by political theory, Klein includes embodied protest such as African American women refusing to give up their seats on the bus; homosexual couples kissing in public; or the choreographic politics of demonstrations or sit-ins.¹²⁸ More contemporary manifestations of this might include political hunger strikes, or environmental activists blockading the A12 motorway in the Netherlands, or Black Lives Matter protests, amongst others. Of course, whilst the political dissent that Klein describes here is activated through the body, it is the case that the inverse can also hold true. If we consider, say, emergency drills, which rely on

¹²² Noë, ‘Newman’s Note, Entanglement, and the Demands of Choreography: Letter to a Choreographer’, 230.

¹²³ Ibid.

¹²⁴ Organisation here refers to the capacity of choreography to structure movement and response. I am not implying that all movement is choreography.

¹²⁵ ‘Physics | Definition, Types, Topics, Importance, & Facts | Britannica’, 28 December 2025, <https://www.britannica.com/science/physics-science>.

¹²⁶ Klein, ‘Dancing Politics: Worldmaking in Dance and Choreography’.

¹²⁷ Ibid, 26

¹²⁸ Ibid.

choreography as “...a safety mechanism to mitigate risk and anticipate danger by training the body to make predetermined decisions in response to a particular cue”,¹²⁹ the construction of power through movement is inverted.¹³⁰ Instead of movement operating as a site of resistance to a political context, it becomes a channel for the imposition of authority, or the management of affect. To illustrate this, Woods interrogates active shooter drills, suggesting that the generator of the movement vocabulary, or choreographer, in this instance is the police.¹³¹ Similarly, in her documentation of post 9/11 simulation drills, Nina Berman notes that “simulation drills are like state-sponsored performance art, where realism is replaced by theatre”.¹³² It seems logical then to suggest that the development and rehearsal of these drills constitutes a sort of choreographic engineering, or a technology of, in this instance, biopolitics, through management.¹³³¹³⁴ This understanding does seem to directly contradict Noë’s suggestion that choreography’s central project “is not to tune us up, or organise us better, but rather, to interrupt or disrupt or, more bluntly, to fuck up these inherited, invisible, unnoticed, familiar, conditioning forms of organisation”.¹³⁵ In other words, to disrupt the status quo. My instinct is not to stake my position in one camp or the other here, but rather to sit with and through this inherent tension. To recognise choreography as constituting a distinct form of organisational knowledge that operates through technological logics without being

¹²⁹ Shannon Woods, ‘Drilled Choreographies: Interventions on Preparing for the Active Shooter’, *Conversations Across the Field of Dance Studies* 43 (2024): 197, <https://doi.org/https://doi.org/10.3998/conversations.5956>.

¹³⁰ See for instance André Lepecki, ‘Choreopolice and Choreopolitics: Or, the Task of the Dancer’, *TDR: The Drama Review* 57, no. 4 (2013): 13–27, <https://doi.org/10.4324/9781003282969-48>; or Foster, *Corporealities*.

¹³¹ Woods, ‘Drilled Choreographies: Interventions on Preparing for the Active Shooter’.

¹³² Berman Francesca Laura Cavallo, ‘Rehearsing Disaster Pre-Enactment Between Reality and Fiction’, in *Performance Zwischen Den Zeiten: Reenactments Und Preenactments in Kunst Und Wissenschaft*, ed. Adam Czirak et al. (transcript Verlag, 2019), 187, <https://doi.org/10.14361/9783839446027-012>.

¹³³ Biopolitics here is understood in the Foucauldian sense – that power operates not unilaterally, but rather in dispersed, micro-level relations, which are strategically coordinated and amplified into larger systems of population management. It is, ultimately, always born of something other than itself. Maurizio Lazzarato, ‘From Biopower to Biopolitics.’, *Pli: The Warwick Journal of Philosophy* 13, no. 8 (2002): 1–6.

¹³⁴ Earlier I stated that engineering and technology are not interchangeable; this still holds true, and I am not conflating them here. Rather, I am suggesting that the *process* of choreography in this context operates as a technology of biopower, where technology is understood as a complex system of interoperable techniques and tools.

¹³⁵ Noë, ‘Newman’s Note, Entanglement, and the Demands of Choreography: Letter to a Choreographer’, 231.

reducible to them means to inhabit this grey zone, or ambiguity, and to be cognisant of its underlying capacity to both disrupt systems and to reinforce systems of control.

A way through which to consider this relationship between choreography and technology is through the work of Jacques Ellul, who's observation on the nature of technology is a deeply useful reflective lens:

Even when technology is abstract, procedure, an organization, it is far more of a mediation than an instrument. People generally conceive of technology as a means of action allowing man to do what he was unable to achieve by his own means. That is true, of course. But it is much more important to consider that these "means" are mediation between man and his natural environment. This mediation can be either passive or active. Man has thus created a whole set of mediations all around himself.¹³⁶

To consider choreography in this light is to recognise it as a mediating system between bodies, spaces, and cultural meanings. Neither technology nor choreography are self-sufficient entities, capable of developing outside of a given economic, political and intellectual context.¹³⁷ Similarly, Simondon's process of concretization gives the technical object an intermediary place between the natural object and the scientific representation of the abstract.¹³⁸ This might also describe the position of choreography; it is neither purely bodily, nor purely conceptual. For instance, the concretization process as it might apply to *Art.i.Fact* might look like: embodied movement, capture technology and particle visualisation systems become integrated into new choreographic objects, that function as concrete technical mediators between physical and virtual realms, and each element serves multiple interdependent functions within the system. Both technology and choreography consist of material apparatus; choreography's technological infrastructure includes notation systems such as Laban or Benesh, training regimes, institutional apparatuses, and codified techniques. It is here that we see their shared logic, as overarching systems of principles, methods, and knowledge.¹³⁹

¹³⁶ Ellul, *The Technological System*, 34.

¹³⁷ Ibid

¹³⁸ Simondon, 'Genesis of the Technical Object: The Process of Concretization'.

¹³⁹ There is a distinction to be drawn here between technology (overarching) and practice (implementation). This follows distinctions in other domains, for instance medicine and medical practice; or pedagogy and teaching.

Choreographer and dance scholar Johannes Birringer also infers a relationship between choreography and technology, though in slightly different terms. For Birringer, “it is the convergence of choreography with instrument and system design – the languages of programming, electronic music, and film editing in real-time processing that I define here as ‘choreographic system’”.¹⁴⁰ So, choreographic systems posit an expanded notion of choreography, which, he argues, is an interactional system, implying “particular articulations in continuously emergent relations”.¹⁴¹ This reinforces Ellul’s assertion that the logic of technology is relational; it does not exist in a vacuum.

What follows below is an analysis of how these choreographic systems illustrate a development of choreographic practice, beyond what Susan Leigh Foster describes as “a plan or orchestration of bodies in motion”.¹⁴² As I have already argued, choreography is profoundly altered, both conceptually and practically, by its interaction with technology. However, what remains constant are the core facets of choreography, as per Foster’s description: a plan or orchestration (organising principles) of bodies (performers) in motion (movement). Therefore, we might say that choreography, regardless of its context, consists of a series of *organising principles*, which may differ across contexts and practices; it is concerned with the *performers* that execute these principles; and the *movements* that convey its cultural positioning and meaning. Sarah Rubidge reflects,

Interactive digital media only begins to make a significant contribution to choreography as an art when its underlying principles are taken on board and become central to the choreographic thinking which underpins any work using interactive media.¹⁴³

Though over twenty years old, her instinct was quite ahead of its time. As I have already outlined, it is only through exposing the logics of each domain that we can fully understand how choreographic practice can both be expanded by, and push back against, technology.¹⁴⁴ Whilst practitioners including Gibson/Martelli, William Forsythe,

¹⁴⁰ Birringer, ‘Choreographic Performance Systems’, 471.

¹⁴¹ Ibid, 468

¹⁴² Susan Leigh Foster, ed., *Worlding Dance*, Studies in International Performance (Palgrave Macmillan, 2011), 15.

¹⁴³ Sarah Rubidge, ‘Digital Technology in Choreography: Issues and Implications’, paper presented at 17th Annual Symposium of the Dance Society of Korea, 2002, 4.

¹⁴⁴ As I have laid out, the broad understanding of technology as *techne*, and its corresponding logics, is what underpins my theoretical framework. However, in my analysis I refer specifically to digital

Alexander Whitley, CoisCéim Dance Theatre, Wayne McGregor, Akram Khan and Gilles Jobin to name just a few, have been experimenting with the types of technology under analysis in this chapter, a growing body of choreographic practice also engages with technology at a critical level. Works of this nature include *Cryptodance Initiative*, which collectively reflects on issues of privacy, safety and surveillance and *Body.Scratch*, which interrogates algorithmic transparency and literacy.¹⁴⁵ This approach is also evident in exhibitions such as *Higher Resolution* at the Tate Modern, curated by Hyphen Labs and Caroline Sindors, which explored the dynamics of user interactions with machines and algorithms that influence their privacy, behaviour and digital rights.¹⁴⁶ Finally, Blast Theory's work *Karen* functions as commentary on corporations' personal data-mining and psychological profiling procedures.¹⁴⁷ Drawing on both conceptual and methodological insights from these works, what follows analyses how choreographic systems in *Art.i.Fact* and *Traversing Spaces* (with some references to *The Front* and *Untitled*) develop practice beyond Foster's conceptualisation, demonstrating that choreography mediated by technology operates simultaneously as an aesthetic practice and a critical methodology.

2.3 Objects of Analysis

2.3.1 *Art.i.Fact*

Art.i.Fact is a three-minute-long dance work choreographed specifically for virtual reality. Audience members encounter a motion captured (mocap) performer, visually conceptualised through a multicoloured abstraction of the human form in a black, seemingly limitless space. As this dancing form moves through boundless space, the solo audience participant is invited to join it in exploring how they relate to this digital representation of movement, which at specific moments takes on a recognisable human form before dissipating into an abstract particle system once again. *Art.i.Fact* begins in an entirely black surround. As the music rises, a shimmering mirage of colour begins to appear. Slowly, the movement begins to build and travel across space. Though it does not

technologies (motion capture, virtual reality and mixed reality systems) as specific instantiations of technological logic.

¹⁴⁵ Joana Chicau et al., 'Designing Counter-Choreographies: Embodied Choreographic Approaches for Critical Examination of Online Tracking', *Proceedings of the 2025 Conference on Creativity and Cognition* (New York, NY, USA), C&C '25, 22 June 2025, 872–85, <https://doi.org/10.1145/3698061.3726928>.

¹⁴⁶ Tate, 'Higher Resolution | Tate Modern', Tate, 2019, <https://www.tate.org.uk/whats-on/tate-modern/higher-resolution>.

¹⁴⁷ Blast Theory, *Karen*, 2015, <https://www.blasttheory.co.uk/projects/karen/>.

have distinct scenes, the choreography explores the vast expanse of darkness, asking how to conceive of space when it presents no limitations. The participant is free to seek their own perspective on the moving entity, viewing it from any angle or distance they desire. The choreographic score is abstract in nature and does not look to thematic or narrative forms. It explores the locomotion of the human body as it works through a contemporary dance lexicon, and it is mediated through technology (see Figure 1). Throughout the work, the performer approaches and moves away from the audience member, evoking questions of intimacy and aloneness, embodiment, and agency.

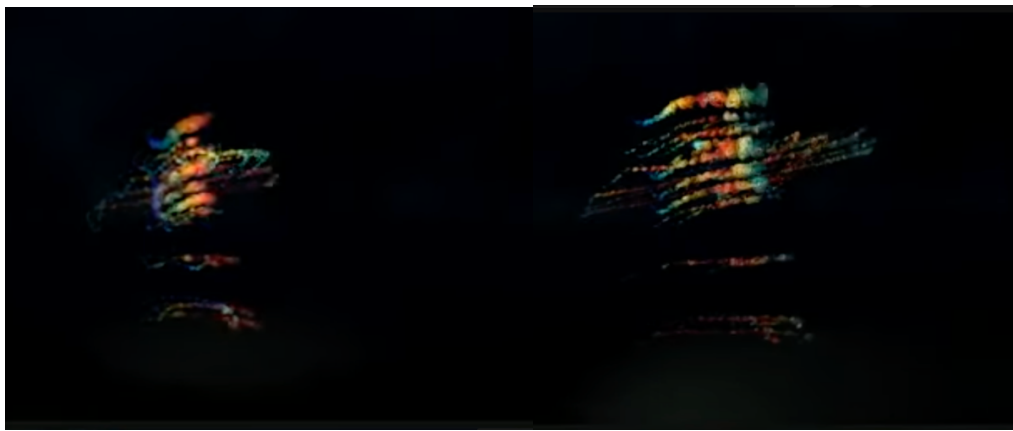


Figure 1: The performer's avatar morphs from human to abstract.

The overarching research question guiding the development of *Art.i.Fact* concerned the abstract representation of movement and the human body in unrestricted space. It sought to explore how these choreographic concerns could be addressed through mocap data visualisation, and how this might work synergistically alongside established strategies from site-specific and immersive theatre practices. Motion data from the performer was captured using a Vicon system,¹⁴⁸ an optical-passive system which uses twenty-four infrared cameras to track retroreflective markers placed on the body of the performer. These movement phrases were then exported to Unity (a game engine),¹⁴⁹ where they were visualised as particle systems. Whilst technologies such as volumetric capture offer a recognisably photorealistic, live-action aesthetic, the data produced often retains the flat qualities of film. It is for this reason that motion capture, which can be

¹⁴⁸ Vicon Motion Systems UK, 'Vicon', Vicon, www.vicon.com.

¹⁴⁹ Unity Technologies, Unity, www.unity.com.

visualised in an unlimited number of ways, was used as the primary means of production. In addition, it facilitates six degrees of freedom (6DOF), meaning that participant can move through the virtual space using forwards/backwards, up/down, left/right motions as well as pitch, yaw and roll (which describes the movements of the head). Finally, the use of mocap data allows for the exploration of one of the core pillars of this research – how do we conceptualise human movement when it is presented beyond the limits of the human form? Said differently, how do we expand the practice of choreography beyond what we instinctively understand as the human form and human spaces? In *Art.i.Fact*, the moving body slips in and out of the humanoid form, at once seeming to establish a connection between spectator and performer and then disrupting it.

2.3.2 *Traversing Spaces*

By contrast, *Traversing Spaces* is a fifteen-minute room-scale mixed-reality (MR) experience for up to six participants, exploring levels of spectatorship within a virtual replica of the physical exhibition space. Within this space, where the virtual is mapped directly onto the physical, participants encounter various scenes, each intended to trigger a different mode of locomotion. Whilst this work does not contain a central performer executing pre-recorded choreography, it focuses instead on the choreography of space, and the choreography of non-dancing bodies within that space.

Traversing Spaces opens in a virtual representation of the physical space (Figure 2) within which the experience takes place. Two large columns dominate both areas, and their geometric representation in the virtual is accurate to their geospatial location in the physical (Figure 3 &4). This is to say that if one were to reach out and touch the virtual column, one would feel the physical column. This is the definition of mixed reality. The use of MR here seeks to include touch amongst the senses being engaged.



Figure 2: The physical space.

Figure 3: 3D Scan of the physical space.

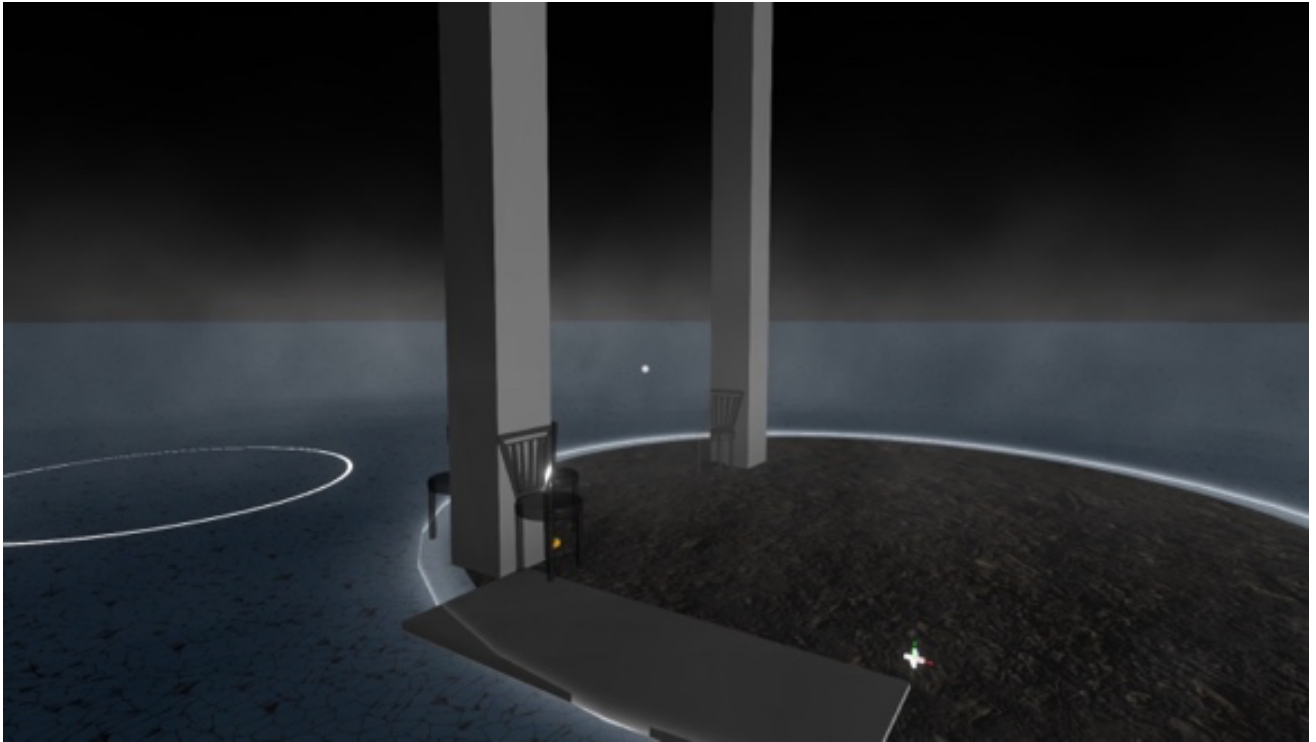


Figure 4: The virtual space.

The experience facilitates up to six participating audience members at a time: two who wear VR head-mounted displays (HMDs) and enter the virtual world; two who carry trackers in the physical space (but do not wear HMDs); and two who simply observe. Those within the HMDs begin seated, their backs to the columns. As they rise from their seats and begin to move through the space, they notice that they are not alone. Curious, they start to follow trails of light – these are the virtual representations of participants with trackers. So begins a duet: improvised moments of togetherness and aloneness.

In the digital realm, a life-size house appears (Figure 5). A light flickers through a window, luring participants in. Inside, a staircase triggers a climbing locomotion, changing their physicality in the physical world. The next scene places them in a forest scape, where it slowly begins to drizzle and then pour with rain. Finally, participants find themselves engulfed by the enormous mouth of a video clip of Samuel Beckett's *Not I*. A 360-degree cylindrical video instigates a spinning motion in participants as they look for a way out (Figure 6). *Traversing Spaces* is a sometimes surreal and challenging experience which toys with audiences' sense of space, presence, and agency.



Figure 5: Disappearing house.

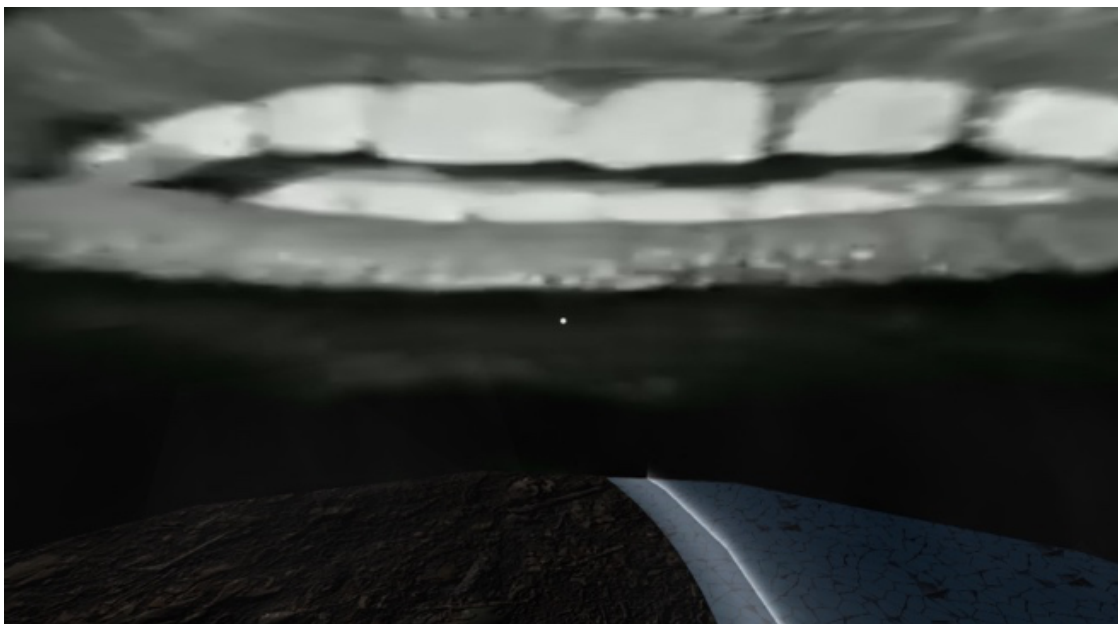


Figure 6: "Not I"

The use of three layers of spectatorship raises questions of performativity – who is the performer and who is the audience? The HMD-wearing audience perceive themselves to be in another space, traversing the experience and engaging with various movement

qualities and with those carrying trackers, observed by those without. Tracker-carriers vie for the attention of those in the headsets, knowing that they are being watched. Even the most passive spectators in *Traversing Spaces* are, to a degree, part of the performance of the physical space. The choreographic thinking, then, is primarily concerned with the organisation of naturalistic movement, embedded in digital and physical space simultaneously.

The work draws on ideas from Tino Seghal's "constructed situations", that is, the generation of intensive but ambiguous embodiments within the framework of mixed reality.¹⁵⁰ As *Traversing Spaces* does not hold a central "performer", it does not use mocap or any other method of pre-recorded data capture. It does, however, use tracking and avatar embodiment. In the case of audience members in headsets, they are represented in the digital realm as a fish avatar, and in the case with those carrying physical trackers, their movements leave a sparkling trail. Evolving through an open, design-led process in a workshop setting, this work-in-progress piece represents an attempt to explore choreographic modalities between realities and layers of spectatorship. Its analysis draws on critical practitioner reflection rather than qualitative or quantitative data from audience members and seeks to examine each element of the work within the theoretical frameworks of contemporary dance.

The aim of *Traversing Spaces* was to explore the performative potential of an audience in a multi-layered way. Specifically, it asked how choreographic systems in mixed-reality experiences might facilitate the physical exploration of a virtual space and engage an audience in an exploration of their embodied presence. It sought to strip movement patterns to their most basic form, and to begin to understand how activating somatic memory in audience members might be used to evoke visceral responses.

The following discussion of *Art.i.Fact* and *Traversing Spaces* will illuminate how my approach to world-building and choreography challenge some traditional design processes, and how the findings from these processes can be put into dialogue with their theoretical underpinnings. Though distinct in their approaches and aesthetics, they should be viewed as iterative processes, with the latter clearly building on learnings from the former.

¹⁵⁰ Toni Pape et al., 'Welcome to This Situation: Tino Seghal's Impersonal Ethics', *Dance Research Journal* 46, no. 3 (2014): 89–100, <https://doi.org/10.1017/S0149767714000370>.

2.4 Movement

In considering how my existing choreographic knowledge might be challenged by its engagement with technology, I began by looking towards motion capture systems (mocap), various forms of which have been used by choreographers for decades. From rudimentary, DIY technologies such as those used by Troika Ranch in the 1990s and early 2000s,¹⁵¹ through to multi-million dollar motion capture studios developed and used for filmmaking,¹⁵² there is a strong existing body of literature, including practitioner reflection, to draw on. I will put the findings from my body of work in conversation with existing scholarship, in the hope of expanding our conceptual and practical understanding.

Mocap is a motion data capture technique that can happen in multiple ways. This includes inertial motion capture, which utilises wearable sensors transmitting data wirelessly to a computer; and optical passive systems that employ infrared cameras to track reflective markers on a performing body. Newer mocap technology also include systems such as RADiCAL Motion or MoveAI, both of which use deep learning networks that detect and calculate human 3D joint rotations over time from video footage. Though an analysis of the benefits and limitations of each of these systems for dance performance is beyond the scope of this chapter, it should be noted that the testing phase of *Art.i.Fact* utilised the Perception Neuron (inertial) system in the testing phases of the work, but a Vicon (optical passive system) for the final capture. This was because higher fidelity data was obtained through the Vicon than the Perception Neuron and was deemed easier to work with by the technologists on the project. Mocap data facilitates the limitless aesthetic transformation of motion data in XR, beyond the realism that is generated through other modes of capture such as 360° video or volumetric capture. Other challenges with these alternatives to mocap include the “flickering” often found of the

[illegible]

¹⁵² Shubham Sharma et al., 'Use of Motion Capture in 3D Animation: Motion Capture Systems, Challenges, and Recent Trends', *2019 International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (COMITCon)*, February 2019, 289–94, <https://doi.org/10.1109/COMITCon.2019.8862448>.

edges of volumetrically captured objects,¹⁵³ or the limited interactivity and non-linear capabilities of both media, when pre-recording is involved. Much of its utility has been observed in archiving and preservation,¹⁵⁴ teaching and learning¹⁵⁵ and the documentation and analysis of dance¹⁵⁶ but it has also been used in performance. An early example of this type of dance work includes *Biped* (1999), a collaboration between Merce Cunningham and digital artists Paul Kaiser and Shelley Eshkar. During this collaboration, Cunningham, working with two dancers and DanceForms, a piece of computer software, choreographed a series of 70 phrases that were transposed into digital images through motion capture. These animated images were then projected onto a scrim at the front of the stage, allowing the virtual and physical dancers to occupy the same physical space.¹⁵⁷ The use of DanceForms in the choreographic process of *Biped* is revealed in the geometry of its movement vocabulary; the software's wireframe figure contains joints that can be manipulated in a multitude of ways to reveal new movement that breaks habitual patterns, but are largely angular and geometric. *Biped* uses motion capture to generate a scenography, an approach I used when creating *The Front* but progressed by using live capture and rendering. In *Biped*, Cunningham begins to explore the idea of limitless space in the work through the use of light and curtained booths at the back of the space, allowing dancers to appear and disappear. I advance this by exploring unbounded space in virtual reality in *Art.i.Fact*.

Later notable works include collaborations between Motion Bank and William Forsythe, in which a series of guest choreographers, including Deborah Hay and Jonathan Burrows, were invited to contribute choreographic scores, which were captured using

¹⁵³ Krzysztof Pietroszek and Christian Eckhardt, 'Volumetric Capture for Narrative Films', *26th ACM Symposium on Virtual Reality Software and Technology*, November 2020, 1–3, <https://doi.org/10.1145/3385956.3422116>.

¹⁵⁴ Matus Hajdin et al., 'Digitization and Visualization of Movements of Slovak Folk Dances', in *The Challenges of the Digital Transformation in Education*, ed. Michael E. Auer and Thrasyvoulos Tsiatsos, *Advances in Intelligent Systems and Computing* (Springer International Publishing, 2019), https://doi.org/10.1007/978-3-030-11935-5_24; Efstathios Stavrakis et al., 'Digitization of Cypriot Folk Dances', in *Progress in Cultural Heritage Preservation*, ed. Marinos Ioannides et al., *Lecture Notes in Computer Science* (Springer, 2012), https://doi.org/10.1007/978-3-642-34234-9_41.

¹⁵⁵ Iris Kico et al., 'Digitization and Visualization of Folk Dances in Cultural Heritage: A Review', *Inventions* 3, no. 4 (2018): 4, <https://doi.org/10.3390/inventions3040072>; Yoko Usui et al., 'The Effect of Motion Capture on Learning Japanese Traditional Folk Dance', 24 June 2013, 2320–25, <https://www.learntechlib.org/primary/p/112295/>.

¹⁵⁶ Alaoui, S., Carlson, K. & Schiphorst, T. (2014). *Choreography as Mediated through Compositional Tools for Movement: Constructing A Historical Perspective*. *MOCO*. <https://doi.org/10.1145/2617995.2617996>

¹⁵⁷ 'BIPED - Merce Cunningham Trust', accessed 14 May 2026, <https://www.mercecunningham.org/the-work/choreography/biped/>.

video cameras and Microsoft Kinect, before the data was visualised and used to create and open source a repository of dance data.¹⁵⁸ Though its initial aim was the documentation of dance through the creation of online scores, what emerged was a new choreographic object. In its pilot project, *One Flat Thing, reproduced*, Forsythe and colleagues tracked the trajectory of the choreographic ideas from live performance, to capture data, to the “innumerable manifestations...of choreographic thinking in this dance”.¹⁵⁹ This included the creation of animations, maps, scores and new artworks, amongst others. It suggests that despite its abstraction from the body, the underlying logics and organisational principles of a choreography can be extracted from its datafication. The creation of new choreographic objects foreshadows my own conceptualisation of the process of concretization in digital dance, in which the disparate parts of motion capture and choreography become internally coherent and facilitate the expression of a new manifestation of their entanglement. What this project did not fully address however, is the role of the social and relational parts of dance that constitute it, beyond pure movement. Whilst it could be argued that cueing is a form of social and relational data as it operates between dancers, it is better understood here as the temporal architecture of the work than representation or interrogation of social relations. Similarly, the organising principle of alignments, or the construction of moments of synchronicity with another individual or group within the choreographic structure, might also be considered as relational data. However, its synthetic nature offers little insight beyond revealing the choreographic thinking it emerged from. Interestingly, this limitation is recorded in the attribute data, though it is not presented as a limitation. Shaw notes that dancers’ accounts of their experience of the choreography differed when interviewed about cuing and movement material, implying the challenge in quantifying dance data.¹⁶⁰ In my works, particularly in *Traversing Spaces* and *The Front*, I draw out the logics underpinning the unquantifiability of the parts of dance data that challenge the mathematical underpinnings of capture systems, and argue that the loss of this social and relational data renders the data vulnerable to appropriation. More recently, artists

¹⁵⁸ ‘About | MOTION BANK’, accessed 14 May 2026, <https://www-archive.motionbank.org/en/content/about.html>.

¹⁵⁹ Forsythe in William Forsythe and Norah Zuniga Shaw, ‘Synchronous Objects for One Flat Thing, Reproduced by William Forsythe’, <https://Synchronousobjects.Osu.Edu/>, Ohio State University, 2009, <https://synchronousobjects.asc.ohio-state.edu/SODanceDataObjectsEssays.pdf.p.4>

¹⁶⁰ Forsythe and Zuniga Shaw, ‘Synchronous Objects for One Flat Thing, Reproduced by William Forsythe’.

including Alexander Whitley and Gibson/Martelli have engaged with motion capture, both live and pre-recorded, in ways that are formally proximate to this research. Gibson/Martelli's use of telemetry in performance and their interest in live motion capture experimentation aligns with the ways in which I have used the technology in *Traversing Spaces*, *The Front*, and *Untitled*. What distinguishes the work generated during this PhD process is that it moves beyond considerations of the ethics of technology as an artistic theme, as is the case for Alexander Whitley, and explicitly addresses the practice and policy implications of the conditions under which mocap data is handled.¹⁶¹

This decision had both conceptual and practical implications. Firstly, the Vicon capture space is limited by the dimensions of its studio (unlike the Perception Neuron, which can be used in any space, regardless of size). During the Vicon capture, a small area constrained the expanse of the choreographic score, which, conceptually, raised questions around the paradox of creating choreography in a restricted physical space, and transposing this into the limitless area of the virtual. Using this as a conceptual driver, the decision to place the avatar in *Art.i.Fact* into an unbounded black space functioned as a means to explore whether choreography requires spatial boundaries to generate meaning. The data obtained from the Vicon system also reproduced the subtle expressions and articulations of the body such that they are still resonant when visualised in an abstract way. This fidelity of data has been, and continues to be, an issue for dancers and choreographers, though it should be noted that it is improving rapidly. Movement vocabularies, including for instance floor work, or spinal articulations, which up until now have been problematic,¹⁶² are becoming less so through the development of more precise ways to both record and capture movement data. This is perhaps due to the awareness on both side of the issue – choreographer and developer alike.

While dance benefited from the advanced motion capture technologies that emerged in recent years, it also met the challenge of capturing and defining movement quality. Motion capture technologies show potential in quantifying the functional parts of the dance movement by modelling and recognising pre-defined

¹⁶¹ An analysis of Gibson/Martelli's approach to motion capture can be found in Vincs, 'Virtualizing Dance'. deLahunta provides an overview of the Motion Bank project in his chapter in Maaïke Bleeker, ed., *Transmission in Motion: The Technologizing of Dance* (Routledge, 2017).

¹⁶² Problematic here refers to movement qualities that are challenging to reproduce in a digital avatar, either due to hardware constraints (e.g. marker occlusion during floor work) or representational fineness (e.g. spinal articulations).

movement sequences. However, qualifying the expressiveness of those movements is a much harder challenge for HCI researchers to design computational support for.¹⁶³

In other words, motion capture technologies struggle to quantify the parts of dance movement that stretch beyond the mathematical logic that underpins the system. They decontextualise movement, rendering “genres of dance as standardised practices constructed of elemental components that can be assembled or disassembled in technological and impersonal modes”.¹⁶⁴ The unquantifiable, expressive elements of dance poses a challenge to this system, and the tension here between choreographic systems, which prioritise expressiveness, and the digital system that is built on often rigid, mathematical logic must seek a resolution. In a way, by choosing to engage with mocap, the technological logics become choreographic logics; dance movement is systematised through mocap, which converts embodied movement into transferrable data. It requires a specific movement vocabulary, which must be “readable” to the mocap system, or an attentiveness and curiosity to the potentialities that arise when the system fails.¹⁶⁵ For instance, this might include calibration issues that produce floating limbs, or a body that can function with ease half submerged in the floor. What might I be able to add to my movement vocabulary if I used these glitches as prompts or creative impulses? It is in this liminal space between logics that my practice seeks to extend choreographic thinking, using mocap technologies to explore sensations and expressions of force, form and movement that move beyond generic and familiar bodily motion and towards generating altered and emergent kinaesthetic and proprioceptive perceptions. Here, dance motion can become simply a line, an arc, a shape, or an expression of elemental force or energy, first captured as data and then visualised in various aesthetic, experimental and abstract modes.¹⁶⁶ Drawing on Simondon’s theory of concretization, this live choreographic knowledge becomes a technical choreographic object through its transformation from

¹⁶³Zhou et al., ‘Dance and Choreography in HCI’, np.

¹⁶⁴Strutt, ‘Motion Capture and the Digital Dance Aesthetic: Using Inertial Sensor Motion Tracking for Devising and Producing Contemporary Dance Performance’, 135.

¹⁶⁵ There have been some attempts to quantify the expressive movement qualities of dance. For instance, Stefano Piana et al., ‘Towards a Multimodal Repository of Expressive Movement Qualities in Dance’, *Proceedings of the 3rd International Symposium on Movement and Computing*, 5 July 2016, 1–8, <https://doi.org/10.1145/2948910.2948931>. have attempted to build a repository of expressive movement qualities from the perspective of the observer; of course, this omits the perspective of the performer and therefore cannot be seen as a complete data set.

¹⁶⁶Strutt, ‘Motion Capture and the Digital Dance Aesthetic: Using Inertial Sensor Motion Tracking for Devising and Producing Contemporary Dance Performance’.

disparate mocap elements to integrated visualisation system to unified mediating apparatus.

To return to *Art.i.Fact*, it fundamentally challenges choreographic movement by severing it from fixed human form. It uses a custom-built avatar morphing between a recognisable human form and an abstract particle system to explore choreography's capacity to organise movement beyond bodily limitations. In development, the movement vocabulary was rooted in contemporary ballet technique, codified through its precise grammar. This decision was taken due to its ordered, geometric nature, which the capture technology found easier to manage than improvised, authentic movement.¹⁶⁷ For instance, the opening movement begins with a port de bras, from bras bas through demi-seconde.¹⁶⁸ It contains movements such as ronds de jambs and chaîne turns amongst others, each chosen for their almost mathematical nature and capacity to generate volume and speed across the floor. In addition, this creative choice offered an opportunity to test what the computational system privileges and why.

During the capture sessions, some findings became apparent. It was noted that very small, subtle movements were rendered invisible when transferred from the performer to the avatar, and this conditioned the choreographic logic further by setting parameters for the scale of movement.¹⁶⁹ During the rendering process, it also became clear that the kinetic energy generated in live performance could not be replicated in a humanoid avatar, and so the decision was taken to abstract the movement data, developing trails to convey some spatial dynamics. As Laura Karreman writes:

...far from being objective, the motion capture data evolve from a process that is thoroughly constructed. This construction necessarily involved a high degree of

¹⁶⁷ Authentic movement refers to an improvisation practice which seeks to draw out the natural movement of the body, rather than any specific codified technique. For further details, see Patrizia Pallaro, ed., *Authentic Movement: Essays by Mary Starks Whitehouse, Janet Adler and Joan Chodorow* (J. Kingsley, 1999).

¹⁶⁸ Bras bas (also referred to as preparatory position or 5th position en bas) refers to a neutral starting position for the arms in ballet terms. Demi-seconde is also a preparatory position, though it is usually initiated from bras bas.

¹⁶⁹ I use the term 'condition' here rather than 'constrain', as it implies that technology creates new parameters that necessitate innovation rather than simply limiting existing options.

reduction and abstraction of the phenomenon of dance as it is perceived during live performance.¹⁷⁰

This “gap” between embodied movement and its virtual representation was managed through an open workflow, whereby experimentation was fundamental and there were no preconceived ideas regarding the output. This is in contrast to say, game development or sport medicine which utilise data as a means to an end for an expected outcome.¹⁷¹ We also quickly realised that we would need to custom build the particle system, as there was a mismatch between our priorities and those of the software rendering system (Unity), where the choreographic logic required different physics to those offered by off the shelf options. Whilst this approach to data visualisation was creative and considered, the willingness to, in a way, comply with the logic of the motion capture technology by using a particular movement vocabulary reinforces a very structured movement aesthetic and a hierarchy of technique. In most formal dance education, ballet technique is touted as the foundation of all dance forms, but of course this is a Western, Eurocentric perspective that dismisses techniques and styles of dance that predate it in many other societies. In their research, Vincs and Barbour counter that intense data examination as a result of mocap can disrupt “culture-physical ‘grammars’ of dance creation”.¹⁷² This idea is perhaps most clearly borne out in my later work, *The Front*, which uses mocap in a live performance environment. Instead of using a codified ballet vocabulary, I used structured improvisation to facilitate a different form of engagement with the technology.¹⁷³ What resulted was a unique movement vocabulary that encapsulated technical elements from social dances such as samba; contemporary dance technique; and capoeira. This movement vocabulary was significantly less geometrical than that in *Art.i.Fact* and challenged the system to capture dance data that included spirals, curves and abstract bodily configurations, beyond what can be quantified in a singular stylistic grammar. What it missed in this capture was the kinetic energy transfer between the performer and

¹⁷⁰ Laura Karreman, ‘The Motion Capture Imaginary: Digital Renderings of Dance Knowledge’ (Doctoral Thesis, Ghent University, 2017), 136.

¹⁷¹ David Ritterhaus et al., ‘Recording “Effect”: A Case Study in Technical, Practical, and Critical Perspectives on Dance Data Creation’, in *Dance Data, Cognition, and Multimodal Communication*, ed. Carla Fernandes et al., Routledge Advances in Theatre and Performance Studies (Routledge, 2023).

¹⁷² Kim Vincs and Kim Barbour, ‘Snapshots of Complexity: Using Motion Capture and Principal Component Analysis to Reconceptualise Dance’, *Digital Creativity* 25, no. 1 (2014): 62, <https://doi.org/10.1080/14626268.2013.786732>.

¹⁷³ See chapter 4 for a full analysis of the process

the audience, as the performer moved around, through and with the audience.¹⁷⁴ This departure from easily recognised, technical movement towards a unique mode of embodied performance, including audience interaction, poses new questions for working with this type of technology in choreography. Whilst mocap offers new ways of thinking through the body by disrupting the ““infinitely malleable body” and the “highly technical” body schema binary through alternative forms of visual representation”,¹⁷⁵ it raises the question of how motion capture technology might represent relationality, which in many forms of dance, particularly social dance, is a fundamental component. In *The Front*, the dancer’s movement in relation to the audience was expressed as a live scenography, i.e. the movement capture generated live visuals, but of course this only captures the ghost, so to speak, of the audience member with whom the dancer is in relation. In other words, the system does not capture movement data from the audience member, only the space that they might inhabit as it is experienced by the dancer in the mocap suit.

In developing these works, both capitalised on conventional dance-making workflows. Dancers are used to working through the moving -looking- adjusting feedback loop, using mirrors in dance studios. Working with mocap utilises this pipeline, and in being able to move through, around and into digital forms by utilising 3D or interactive platforms, new movement potentials, insights and forms could be revealed.¹⁷⁶ It also holds the potential to make visible the interior world of a dancer, in ways that are otherwise inaccessible.¹⁷⁷ As I explore in chapter 4, this brings forth a new and complex set of issues to navigate, including data privacy, ownership and contracting. However, having established how motion capture constrains and enables movement vocabularies, the analysis now turns to how spatial and temporal organising principles are reconfigured by digital mediation.

¹⁷⁴ See Appendix C, performance footage.

¹⁷⁵ Vincs and Barbour, ‘Snapshots of Complexity’, 63. The infinitely malleable body refers to the abstracted, fluid and expressive body, which may be seen as the conceptual opposite of the highly technical, controlled and disciplined body.

¹⁷⁶ Strutt, ‘Motion Capture and the Digital Dance Aesthetic: Using Inertial Sensor Motion Tracking for Devising and Producing Contemporary Dance Performance’.

¹⁷⁷ Karreman, 2017

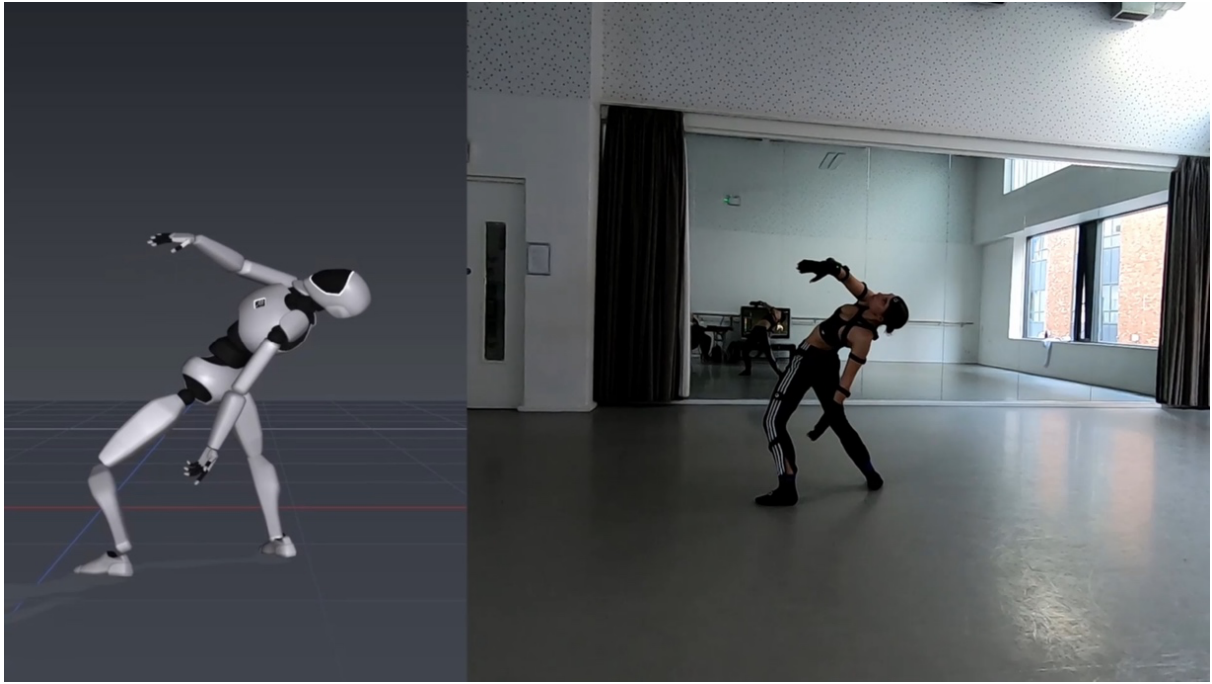


Figure 7: The Perception Neuron suit in use – it is highly portable and can be used in many locations.

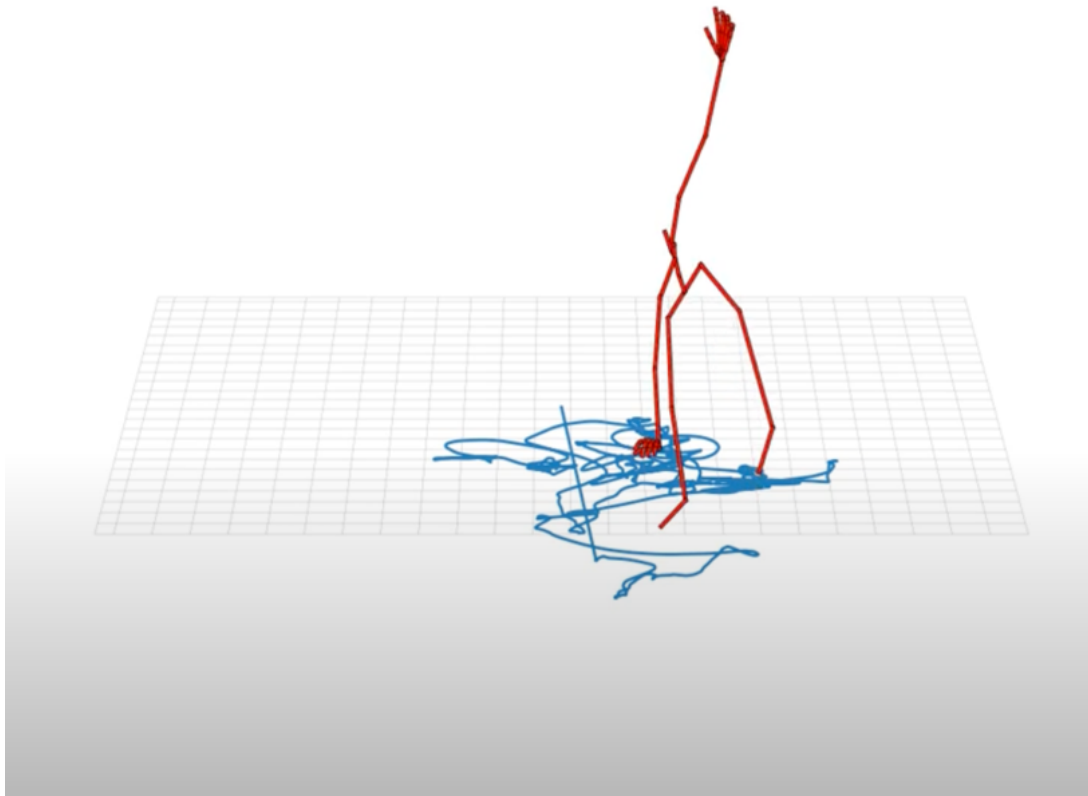


Figure 8: Movement data visualisation during the testing phase.

2.5 Space*Time

Digital technologies fundamentally reshape the key choreographic organising principles of space and time. Their unsettling of established norms can be seen when considering dance scholarship that contends that “performance’s only life is in the present..”,¹⁷⁸ or “if we consider that dance is a performing art, requiring embodied presence, virtual dance (in the technological sense of the word) does not qualify as dance (...) Virtual dance has no weight, no breath, no spontaneity.”¹⁷⁹ While it could be argued that this statement conflates embodiment/disembodiment with liveness/recording, it is clear that the distinction between what we might consider “live” dance and “virtual” dance is certainly complicated by the integration of the types of digital technologies under discussion. Boucher’s definition of virtual dance seems more applicable to screen dance, as it fails to account for the kinaesthetic and affective potentials of mocap and VR-based performance environments. For instance, virtual dance, via motion capture data does, of course, have weight; its expression as a particle system, or any other visualisation, has computational weight. Equally, the breath of dance in virtual reality is limited only by the imagination of its creator, given the infinite nature of virtual space. Hybrid spaces can offer moments of spontaneity for both performer and audience, as I will demonstrate. In fact, both *Traversing Spaces* and *The Front* support Hansen’s assertion that the full meaning of the work manifests or is revealed in its interaction with the spectator/user.¹⁸⁰

Traversing Spaces approaches choreography in an altogether different way than my other works. Rather than thinking of choreography in terms of a series of movement scores executed by a professional performer, *Traversing Spaces* considers choreographic strategies to engage dialectical processes between the macro and the micro within the physical and digital spaces. The choreography in *Traversing Spaces* choreographs “structures and environments specifically intended to impact spectators’ kinaesthesia ... their affective experience of embodied movement”.¹⁸¹ In other words, it functions as a design technology; it organises spatial, sensory and temporal conditions to affect how users move, perceive and relate. In suggesting that choreography can be a means of creating shape and structure, it follows that the choreography itself becomes a relational

¹⁷⁸ Peggy Phelan, *Unmarked : The Politics of Performance* (Routledge, 1992), 146.

¹⁷⁹ Marc Boucher, ‘Virtual Dance and Motion-Capture’, *Contemporary Aesthetics* 9 (March 2011), section 9.

¹⁸⁰ Mark B. N. Hansen, *New Philosophy for a New Media* (MIT Press, 2004).

¹⁸¹ Ritter, *Tandem Dances*.

object, building relational encounters between the participants, the technology, and the physical space. This approach to the choreographic process in *Traversing Spaces* is exposed using compositional layers that behaved as both a directing or narrative tool, and movement pathways that create certain possibilities whilst foreclosing others. It extends Ritter's theorisation on the relationality between audience and performer in immersive environments by including technology as the final element in this triad and enlivens my argument regarding choreographic potential becoming activated under specific conditions requiring coordinated bodily response.

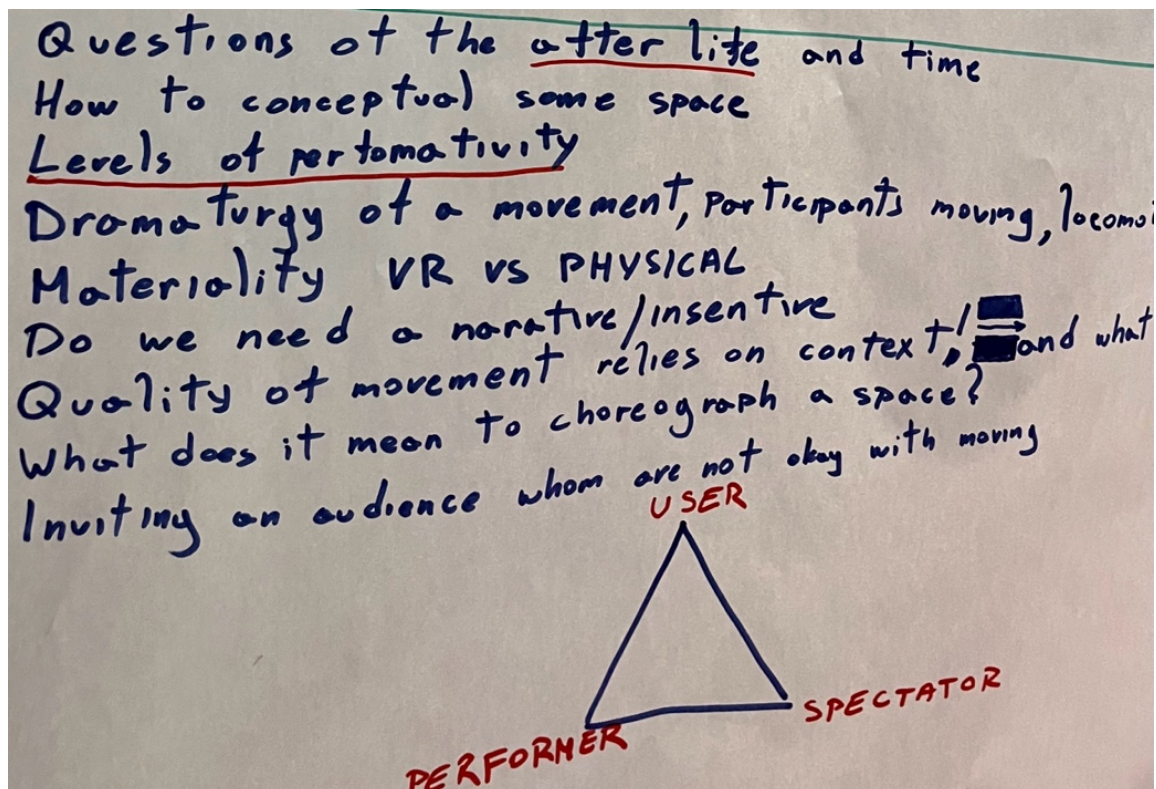


Figure 9: Studio notes on the development of *Traversing Spaces*

The guardian system in *Traversing Spaces* exemplifies how technical constraints function as choreographic agents when approached through the question of whether choreography operates through technological logics. The Oculus Quest 2 VR headset holds an inbuilt safety feature that prevents users from injuring themselves by walking into physical barriers (such as walls or columns). A room-scale boundary is drawn at the

beginning of each VR session, and if a participant or user steps close to the edge, a vertical blue grid appears. The Quest 2 also holds a pass-through function; when a user approaches the edge of the boundary, the space that they see outside of the blue grid is a grey-scale camera view of the physical space within which the experience is held. Rather than treating this as a limitation to minimise, I built it into the choreographic strategy to serve two purposes. Firstly, the inclusion of this feature in the choreographic process through choreographing a pathway that would instigate a break in immersion drew attention to the corporeality of the user as they transitioned between the physical world and the digital. The choreography here mediates between layers of realities, testing how system “failures” might operate as choreographic scores themselves. Similarly, once participants with trackers stepped out of the digital boundary, their virtual presence was no longer visible. This loss of connection between HMD and tracker-users often triggered frantic movement, as tracker-users attempted to re-enter the virtual field of visibility; a moment of spontaneous, system-induced choreography. The guardian system also constricted the movement range of headset users, allowing us to direct their navigation through the scene. In this way, the choreographic score developed in *Traversing Spaces* leaves space for agentic decision-making though the interplay of control and freedom, though it equally exposes the falsity inherent in the concept of agency within this type of work.¹⁸²

¹⁸² Ritter, *Tandem Dances*.



Figure 10: Audience in HMD interacts with audience carrying tracker

As both *Art.i.Fact* and *Traversing Spaces* are non-narrative works, the strategies for moving audiences through them took some experimentation. In many VR experiences, the use of gamification, or the risk/reward paradigm in which users perform tasks or search for clues within the experience to reach the next phase, is a common strategy. As my practice sits closer to immersive theatre, it was important that I find a different approach for these works. Whilst it was less of a consideration for *Art.i.Fact* due to its duration, the relationship between the choreography as it relates to the performer, and the choreography as it relates to the space, and the interaction of those elements with the movement of the user was a central tenet in this work. When, for instance in *Art.i.Fact*, the particle system moves across the space towards the user, it behaves as a prompt for the user to step backwards, framing a new viewpoint from which to experience the next phrase of the work.



Figure 11: The avatar travels towards the viewer and dissipates around them

As the duration of *Traversing Spaces* was much longer and encompassed physical and virtual realities without the use of a linear narrative, considering how a movement pathway might be designed through the physical and digital spaces was significantly more complex. It built on the experiences from *Art.i.Fact* and incorporated techniques used in live performance to direct attention. As it did not contain a central performer, it sought to create an impetuous for user movement through avatar representation, lighting, and sound cues. In this way, light and sound became choreographic tools, prompting the users to move towards or away from specific locations, or in a certain direction. It should be noted that these are more challenging to control in virtual spaces, and that rather than simply relying on pre-recorded clips or programmed “interactions”, the physical manipulation of elements within the virtual space through a midi-controller can add to the ephemerality of the experience while at the same time guiding the trajectory of the user.

Traversing Spaces exposes multiple competing temporalities that destabilise conventional choreographic time. Firstly, it both challenges and reinforces notions of ephemerality through its hybrid structures. The moments of spontaneity between users are fleeting, uncapturable and ephemeral in their nature. But the platform architecture enables

these moments to remain long afterwards, stored on a cloud server in a data centre.¹⁸³ So what counts as the choreography here to be recorded or discussed as it related to its temporal dimensions? This apparent paradox reveals a complex temporal architecture; what appears as a simple tension between ephemeral experience and persistent data actually involves multiple, overlapping temporalities, converging at different ontological levels. Steigler describes temporality as “..an originary coupling of the living being and the non-living in which the living being, as Present Living Being is never without death”.¹⁸⁴ Steigler is not referring here to biological death, but rather to the fact that human presence is always mediated by technical objects that are themselves “dead” or inorganic, but carry traces of human activity. It is possible to identify here a form of “discourse network”;¹⁸⁵ a series of distinct temporal layers in mixed reality choreography. Hardware time (e.g. refresh rate of the headset), software time (e.g. rendering cycles), network time (e.g. cloud server delays) and experiential time (e.g. the duration of user or performer engagement or attentional rhythms). Their interaction brings to life Steigler’s assertion that “the chief consequence of the fact that ours is indeed an age of programming industries and of industrialised memory is that industrial memory’s product is a flux in which absolutely unique temporal objects appear, objects whose flux coincides with the flux of the consciousness it produces”.¹⁸⁶ In other words, these temporal layers do not simply co-exist; they actively render the possibilities for choreographic encounters. This multiplicity complicates the question of what counts as the choreography to be recorded or discussed in relation to its temporal dimensions.¹⁸⁷ Rather than treating data persistence as a form of temporal preservation analogous to recording, we might understand computational storage as constant re-inscription. What gets “stored” are not the interactions themselves but highly abstracted representations (coordinate data, timing information, system states). The qualitative dimensions of interaction, for instance the hesitation before movement, the quality of attention or the affective resonances between

¹⁸³ It should be noted that I am not conflating phenomenological ephemerality (the unrepeatable nature of lived moments) with technological persistence (the material substrates of digital systems); I am suggesting that choreography that engages with technology must account for both ontological levels.

¹⁸⁴ Steigler, *Technics and Time, 2: Disorientation*, 190.p.190

¹⁸⁵ Friedrich Kittler, *Discourse Networks 1800/1900*, trans. Michael Metteer and Chris Cullens (Stanford University Press, 1990), 369. A discourse network refers to “the network of technologies and institutions that allow a given culture to select, store and process relevant data”.

¹⁸⁶ Steigler, *Technics and Time, 2: Disorientation*, 241.

¹⁸⁷ This is not a new problem in dance; its recording, or lack thereof, has always been a challenge. See introduction for further analysis.

participants, exist only in the irreducible present of experience and resist computational capture.

The other temporal structure exposed here is the non-linear unfolding of the work, which forces a reconsideration of how elements of the choreographic composition interact with one another. In a way, this thinking is not that different to the way in which many contemporary choreographers, beyond those working with technology, structure their work. For instance, both William Forsythe and Ohad Naharin engage ways of working whereby individual responses to movement by the dancers build and cohere into a larger choreographic vision.¹⁸⁸ What is different however is that the performers in this case are not (to our knowledge) trained dancers, and thus their level of unpredictability is higher. While human performers introduce embodied spontaneity, the technical systems introduce their own forms of temporal disruption (network latencies, processing delays, sensor calibration drift) that exist outside human control or awareness but fundamentally shape the choreographic possibilities. This interaction is illustrated in moments such as when, at the beginning of the performance of *The Front*, the rendering of the motion capture particle system lagged, causing the experiential time of the dancer to be disrupted. Similarly, in this work the duration is user-driven and co-authored, meaning that it is driven by interaction rather than sequence, and shaped by the delays or ruptures between physical action and digital representation.

This is in contrast to a later hybrid work, *Untitled* (see chapter 3 for a full analysis), sections of which employ a similar choreographic logic. What is different however is that the duration is constrained by a system of choreography that facilitates spontaneous interaction between, in this case professional performer and audience, only for a specific amount of time. This is demarcated by a shift in music and light. The tempo and rhythm in these sections is also dictated by this interaction; the internal timing structures of the work are destabilised because the system's response time depends on sensor calibration, processing delays and unpredictable user input. This forces the choreographic rhythm to become adaptive rather than predetermined, generated in the moment. It spawns a sort of self-organising temporality where each action begets the next and the elements rearrange themselves in response to the previous input. This practical finding echoes philosopher Brian Massumi, who suggests that “a key to the rethinking of

¹⁸⁸ Jenny Roche and Stephanie Burridge, *Choreography: The Basics*, 1st edn (Routledge, 2022), <https://doi.org/10.4324/9781003020110>.

affect is the feedback of atoms of "higher" modes of organization into a level of emergence".¹⁸⁹ In other words, in dynamic systems, affect emerges through recursive loops across organisational levels. This is not entirely new choreographic thinking, but it represents a significant departure from conventional choreographic approaches, whose temporal structures are rigid and bounded.

2.6 Performer? Collaborator? Co-creator?

Digital systems in choreographic contexts operate as collaborative agents with their own agendas, not neutral tools. This distinction fundamentally reconfigures creative relationships and necessitates examining who decides, who authors, and who controls when choreographic systems meet algorithmic systems? Choreography and technology both function as mediators, between performer, time, and space. This is profoundly different to the manner in which digital tools have traditionally been used in dance practice.¹⁹⁰ Many are compositional tools, a sort of predecessor of GenAI tools like ChoreoCraft. These include systems such as ISADORA or COMPOSE, and their function is either recording, archiving,¹⁹¹ dissemination,¹⁹² or compositional assistance.¹⁹³ The proposition of the digital technology I have been discussing is fundamentally different; it behaves more like a meaningful collaborator or medium than a simple tool. As Birringer notes, "...digital devices and algorithmic organising have their own agency",¹⁹⁴ which means that they exert their implicit assumptions over the process. Understanding this collaborative dynamic requires revisiting the temporal framework established earlier. Following Stiegler's concept of "originary coupling," the collaboration between human consciousness and technical systems isn't an external relationship but the very condition through which both human and technological capacities emerge.¹⁹⁵ The multiple

¹⁸⁹ Brian Massumi, *Parables for the Virtual Movement, Affect, Sensation* (Duke University Press, 2002), 34.

¹⁹⁰ Though it should be acknowledged here that the way in which the performing body is theorised is also challenged by this, this is unpicked in chapter 3 and as such this section will focus largely on how audience-as-performer/performer-as-audience functions.

¹⁹¹ see for instance the IJPADM Special Issue, edited by delahunta, Rittershaus & Stancliffe. Scott delahunta et al., 'Editorial', *International Journal of Performance Arts and Digital Media* 17, no. 1 (2021): 1–6, <https://doi.org/10.1080/14794713.2021.1893001>.

¹⁹² Scott deLahunta and Norah Zuniga Shaw, 'Constructing Memories: Creation of the Choreographic Resource', *Performance Research* 11, no. 4 (2006): 53–62, <https://doi.org/10.1080/13528160701363408>.

¹⁹³ Iago Felicio Dornelas et al., 'Systematic Mapping of Technologies for Supporting Choreographic Composition', *Journal on Interactive Systems* 13, no. 1 (2022): 1, <https://doi.org/10.5753/jis.2022.2635>.

¹⁹⁴ Birringer, 'Choreographic Performance Systems', 471.

¹⁹⁵ Stiegler, *Technics and Time, 2: Disorientation*.

temporalities identified previously - hardware time, software time, network time, and experiential time - don't simply coexist but become what Donna Haraway calls "polytemporal, polyspatial knottings",¹⁹⁶ where different flows become temporarily coordinated and generate meaning through their ongoing relational processes.

Whilst the development of many contemporary dance works can be considered within a co-creation framework through task-based prompts for dancers, including rule-based improvisation, scores and game structures used both during the creation process and/or in performance,¹⁹⁷ the development of work for and with immersive technologies adds another layer to this process. Stephanie Hutchison, a dance artist working at Deakin Movement Lab, suggests a parallel between working with technologies and contact improvisation. Hutchison considers that her dance "partners" in motion capture are markers, animations, motion graphics, avatars and the spatial reality of the motion capture volume.¹⁹⁸ The notion of partnership however requires some further consideration - in its execution, the agenda of each partner is laid bare. The human operators of these "partners", namely the computer scientists, creative technologists and technicians must also be considered in their influence on the choreographic outcomes through interdisciplinary dialogue. By contrast to collaborations with, for example, lighting designers or composers, which often have established common grammars built through established relationships or educational proximity, Nesta argues that "dance-digital collaborative works also often prove difficult to produce because incongruities into the underlying principles, methodologies, and languages of each separate practice".¹⁹⁹ As I have already established, this is common not only in practice, but also in the ways through which research in this area is conducted. Whilst three of my four works had clear artist-creative technologist relationships at their core, necessitating the navigation of all the issues that Nesta outlines, my final work, *Untitled*, managed this differently. In my collaboration with scenographer Robin Krijgsman, we came to the process with a shared language of performance, but crucially a shared language of technology. Though neither of us were technologists in the formal sense, our combined experience was enough to

¹⁹⁶ Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene*, Experimental Futures. Technological Lives, Scientific Arts, Anthropological Voices (Duke University Press, 2016), 60.

¹⁹⁷ Scott deLahunta et al., 'A Conversation about Choreographic Thinking Tools', *Journal of Dance & Somatic Practices* 3, no. 1 (2011): 243–59, https://doi.org/10.1386/jdsp.3.1-2.243_1.

¹⁹⁸ Hutchison and Vincs, 'Dancing in Suits'.

¹⁹⁹ Nesta in Strutt, 'Motion Capture and the Digital Dance Aesthetic: Using Inertial Sensor Motion Tracking for Devising and Producing Contemporary Dance Performance', 132.

navigate the research process and negate the need for a specific technologist role. It is likely that we would need to contract a specialist for an iteration of the project beyond the development phase, but this process demonstrated that acquiring some basic technology skills, coupled with expert knowledge on our specialist areas, was a useful strategy not only in speeding up the development process, but in building a new grammar of performance through a collaborative translation at the intersections of disciplines.

In the case of *Art.i.fact*, the choreography conceived in the studio was in dialogue with both human and non-human partners throughout the creative process. This strategy mirrors Rosenberg's contention that collaboration is an integral part of any work mediated through screen,²⁰⁰ and again points to co-creation as a core facet of this type of work. The process sought to test and challenge, but to be mindful of the nuances of each actor within it. For instance, when using the Vicon system, marker occlusion is often an issue. This occurs when the camera's line-of-sight is broken by the body or the floor, and data processing becomes a problem. Through iterative testing, a movement database that is sensitive not only to occlusion, but also to its relationship to the screen, was developed. Hutchison & Vincs suggest that "the geometry of the image must be activated in ways that are consistent with 'its' spatial and temporal parameters".²⁰¹ As such, movement must be considered not in isolation, but rather in conversation with its visual representation, either through an avatar or other visualisation. This process demonstrates contact improvisation practices working across the multiple temporal flows identified earlier. The dancer learns to stay responsive not just to physical partners but to the rhythmic patterns of hardware cycles (camera refresh rates), the processing delays of software (data computation time), and the distributed temporalities of network systems. The abstract particle system that is used to represent the human body-data in *Art.i.Fact* was conceived of during the in-studio choreographic process and formed a central consideration in the movement arcs that constitute the performance. As the particle system trails delineate the movement pathways captured by specific markers, the choreographic approach in *Art.i.Fact* required constant, sweeping movement through the limbs and spine to drive the performance and challenge its representation in space. The ephemeral arcs of movement denote the presence of the dancer in the space, but the movement must be swiftly replenished before all traces of the performance disappear

²⁰⁰ Rosenberg, 'Proposing a Theory of Screendance'.

²⁰¹ Hutchison and Vincs, 'Dancing in Suits'.

entirely. This sets the tempo of the choreography and illustrates the reciprocal relationship between the choreography and the other “partners” in the process. It also solves an unanticipated choreographic problem, in that it operates as a method of generating urgency in unbounded space. It also indicates that spatial freedom paradoxically requires temporal constraints to produce choreographic coherence.

To continue the partnership analogy, contact improvisation allows dancers to find the point where support becomes resistance, or where flow becomes disruption. In needing to replenish the particle trails before they disintegrate entirely, the particle system created in *Art.i.Fact* enforces similar boundaries. Like human partners, whose fatigue, injury or preferences might be built into the collaborative vocabulary, the technology has its own rhythmic demands and idiosyncrasies including, as I have noted, lagging and glitching amongst others. By reframing these from technological nuisance towards simply part of the system, they too can be built into the mechanics of the partnership. The particle system doesn't just represent movement; it creates a knotting where human kinesthetic flow becomes entangled with computational temporality, requiring the dancer's embodied consciousness to coordinate across radically different temporal scales simultaneously.

Exploring the layers of spectatorship and performativity in both *Art.i.Fact* (though to a lesser extent) and *Traversing Spaces*, necessitated its framing within the context of “participatory culture”,²⁰² a term describing an ascendent mode of cultural and technological engagement resulting from the emergence of the Internet. Throughout the choreographic process, fundamental questions concerning performativity within both physical and virtual landscapes were omnipresent. Can users be considered performers themselves, and if so, what is their role in the choreographic process? It is perhaps useful here to consider the audience in Ritter’s terms as “proformers”.²⁰³ These notions of spectatorship, performativity and agency expose the participatory structures that can be built into the choreographic score and exercised in numerous ways. To investigate the agency question directly, *Traversing Spaces* designed three spectatorship tiers as epistemological experiments. What becomes visible about agency when modes of participation are layered? Wearing the VR headset offered users full sensory immersion with apparent spatial freedom; trackers offered presence in the virtual realm whilst remaining fully embodied in the physical space. Finally, a purely observational

²⁰² Jenkins, *Convergence Culture*.

²⁰³ Ritter, *Tandem Dances*.

perspective was incorporated to include audiences who chose not to engage on a technological level.

This design made the agency paradox tangible, resulting in a simultaneous presence and absence; HMD users were present in the virtual space but absent in the physical space where other participants could see their body. This is a complex phenomenon and requires some specificity regarding what is meant by presence and absence. Of course, all participants are *physically* present, but some are *attentionally* absent. For instance, HMD users are physically in the space, but attentionally in the virtual world. Tracker users too were present physically but attentionally absent virtually when they step outside the boundaries of the digital space. Observers saw both physical and virtual representations simultaneously, in what might be constituted as polytemporal, polyspatial spectatorship.²⁰⁴ In other words, the situatedness of entities within multiple spatial and temporal flows facilitates their interaction across space and time. Each type of participant (HMD users, tracker carriers, and observers) creates different knotting patterns of presence and attention, participating and entangled in different configurations of the same choreographic encounter. This pushes beyond the idea of the proformer, by acknowledging existence across multiple ontological registers simultaneously.

By contrast, *Art.i.Fact* seems to hold only one level of spectatorship, yet the knowledge of being observed by waiting audiences acts as a proxy for performativity. The interplay between the internal immersive perspective and the knowledge of an external perspective was referred to by several audience members. Some found this opportunity to “perform” and be observed by others without needing to directly acknowledge them exhilarating (akin to singing in the shower, one participant noted), whilst others found it intimidating.²⁰⁵ Yet, it is crucial to acknowledge the potential inequities within the choreographic framework; not all participants desire to be or, in fact, can be performers. Those boundaries must be incorporated into the work in a meaningful way. This multi-layered approach was not without challenges however, both logistical and in retaining an authorial role. The tension between the artistic impulse to control each variable and interaction, and the experimental spirit of the work whereby the participants stepped into

²⁰⁴ This conceptualisation follows Donna Haraway’s “polytemporal, polyspatial knottings”

²⁰⁵ Participant responses, gathered through informal post-experience discussions, functioned as stimuli for practitioner reflection rather than systematic data collection.

a fertile, multi-layered system was particularly challenging. It required a certain relinquishing of control, which is an uncomfortable space for many artists to inhabit.

The above discussion is not complete without a brief meditation on the role and approach to agency in VR and hybrid environments. Broadly understood as the level of control that users can assert in their environment to manipulate and alter it, it was another key consideration in the development of both works. While it can be argued that agency cannot be given to participants by artists, it holds that the choreography in both works inherently offers space for some agentic decision making.²⁰⁶ Breel's analysis is useful in reflecting upon both works, particularly as it posits that while participants do not lack agency, it may be restricted by the performance context.²⁰⁷ This aligns with the idea that choreography can be applied to audiences (implied in the discussion of choreographic strategies in *Traversing Spaces*) and raises sometimes challenging questions around power and control that might be deployed in designing the experience. In "giving" agency to audiences, we, as artists, are only increasing power in taking it away.²⁰⁸ This agency paradox begins to find a resolution by returning to Haraway's knotting; agency is not possessed by any individual entity within this system, but emerges through the temporary coordination between various flows and the becoming-*with*, acknowledging that neither can be understood in isolation. The "control" artists exercise isn't creative domination but participation in ongoing knotting processes. When artists "give" agency to participants, they are actually reconfiguring the knotting patterns, redistributing how different flows coordinate and elements co-emerge, rather than transferring a possession. In finding a way to manage this, the onboarding process, or introduction to the work prior to putting on the HMD, taking a tracker or taking a seat became a pivotal aspect in both *Art.i.Fact* and *Traversing Space*. It ensured that users were guided into both the physical and virtual worlds and allowed them to understand the scope of their agency and interaction within the experience. Similarly, the facilitation of an informal space for reflection and sharing after the experience became an integral part of both works. This is to say that the experience did not finish after the HMD was removed or trackers returned; rather, this post-experience space allowed participants to process their emotions, thoughts, and

²⁰⁶ Ritter, *Tandem Dances*.

²⁰⁷ Astrid Breel, 'Agency', in *Routledge Companion to Audiences and the Performing Arts*, ed. Matthew Reason et al. (Routledge, 2022)..

²⁰⁸ De Spain, 'Resisting Theory: The Dancing Body and American Scholarship'.

insights, fostering a deeper connection to the performance and enhancing the overall impact of the experience.

2.7 Towards a choreographic framework for immersive technology

It is clear that the reciprocal entanglements between choreography and digital technologies, particularly those situated within the extended reality (XR) spectrum, demand a shift in thinking towards what Birringer terms “techno-choreographic working methods”.²⁰⁹ Whilst it is important to note that, as with any creative process, there is no one way to “do” choreography, choreographers represent their ideas by applying a set of operations onto a choreographic object.²¹⁰ As such, this chapter offers a set of techno-choreographic provocations that have emerged from my own practice that may be useful for others working in the field. Taken together, the four works under consideration, *Art.i.Fact*, *Traversing Spaces*, *The Front* and *Untitled*, demonstrate how choreographic thinking is both challenged and expanded when filtered through, and co-constituted by, technological logics. The two works under primary consideration here, *Art.i.Fact* and *Traversing Spaces* revealed distinct findings that the following section synthesises.

Art.i.Fact

Art.i.Fact's particle decay was not designed to be a temporal driver; rather, rendering tests revealed that without some time-based constraints, the choreographic material lost its coherence and the dramaturgy dissolved. In other words, when spatial boundaries were rendered meaningless in the infinite virtual space, the tempo set by the particle system decay became its key organising principle. In analysing the mechanics of tempo in this way, a new temporal architecture emerged, consisting of four interoperable elements: hardware time, software time, network time, and experiential time. This finding offers a framework for both the development and the analysis of choreography within digital systems. *Art.i.Fact* also brings to life Simondon's process of concretization within the choreographic process by analysing the transformation of choreographic knowledge through technological mediation, from embodied practice to technical object to new choreographic possibilities. This process became visible only once the work's disparate

²⁰⁹ Birringer, 'Choreographic Performance Systems', 470.

²¹⁰ Marianela Ciolfi Felice et al., 'How Do Choreographers Craft Dance? Designing for a Choreographer-Technology Partnership', *Proceedings of the 3rd International Symposium on Movement and Computing* (New York, NY, USA), MOCO '16, 5 July 2016, 1–8, <https://doi.org/10.1145/2948910.2948941>.

parts— its embodied movement, mocap apparatus, capture data, became internally cohesive during the visualisation process in Unity, and were rendered into a new choreographic object in the shape of a VR experience. Taken together, these findings validate the theoretical proposition advanced earlier in this chapter, that choreography functions as a mediating system between bodies, spaces, and cultural meanings, sharing with technology a logic of overarching organising principles and material apparatus.

Traversing Spaces

Traversing Spaces extends these findings in two ways. Emerging from an encounter with the VR system's resistance, the decision to choreograph *Traversing Spaces* alongside, rather than in compliance with, the guardian system, revealed its organisational logic to be negotiated with rather than simply accommodated. Its three-tier spectatorship structure, designed as an epistemological experiment in distributed agency and levels of spectatorship, revealed that creative agency in XR performance is not a property that can be transferred from artist to participant, but one that emerges through the coordination of human, technological, and spatial flows that no single actor controls. Its resolution lies not in the choreographic score but in the onboarding and post-experience structures that frame it. This finding extends the temporal boundaries of choreographic responsibility well beyond the performance event itself. The work also produced a spectatorship model that exceeds Ritter's proformer concept: the simultaneous situatedness of HMD users, tracker-carriers, and observers within different configurations of physical and virtual presence constitutes what this research proposes as polytemporal, polyspatial knotting patterns — a mechanism for understanding how relational experience operates across ontologically distinct spaces simultaneously. This pattern became visible when a tracker user stepped outside the (invisible to them) digital boundary, and their movements in trying to regain the attention of the HMD user in the experience revealed their distinct but interconnected experience of the work. In recording who can be seen, who disappears, and whose movement directs others in relation to the guardian system, *Traversing Spaces* suggests that choreography operating through technological systems functions not only as an aesthetic practice but as a critical methodology, capable of generating knowledge about computational systems through embodied enquiry that technical development alone may struggle to produce.

Findings also emerged when considering *Art.i.Fact* and *Traversing Spaces* together. The shift from ballet vocabulary to improvisatory movement practices emerged in response to what the mocap systems rendered invisible in *Art.i.Fact*. The practice exposed epistemological bias but also my own complicity; even experimental vocabularies were, in a way, constructed for system legibility. The works privilege VR comfortable bodies while critiquing similar exclusions in technological systems, and resultantly this tension remains unresolved. Rather than closing questions, PaR here opens new ones: what are the analytical frameworks that can accommodate and address the polytemporal architecture in this type of work? What movement remains completely illegible to capture, and what does that foreclosure mean? How can distributed authorship be accounted for?

These works collectively play with the limits of the digital technologies they employ, and with the performer's technical practice and self-perception. This way of working illustrates a shift away from choreography as a fixed score towards choreography as a relational system; one that is contingent, polytemporal, and dynamically reconfigured through its interaction with bodies, spaces, and environments. In 2019, Tessa Rixon conceptualised this as a process of symbiosis, identifying:

three points of symbiosis – open/closed scores and open/closed systems, real-time interactivity and composition, and technology as performance – have been identified to address this gap. I suggest this framework of symbiosis – with a focus on the interdependence between the two disciplines – strengthens collaborations between scenographers, technologists, choreographers and dancers.²¹¹

This construction is closely linked to my own, though it does not account for the ways in which this interaction realigns audience relationships, or the latent power structures embedded in both choreographic and technical systems, from the types of movements that are privileged, to the subtle limitations placed on agency and performativity places on audiences and participants in immersive experiences. These are not technical limitations

²¹¹ Tessa Rixon, 'Symbiosis in Digital Performance: The Relationship between Interactive Technologies and Improvisational Choreography', *Behind the Scenes: Journal of Theatre Production Practice* 2, no. 1 (2019): 17, https://doi.org/https://via.library.depaul.edu/bts_journal_of_theatre_production_practice/vol2/iss1/2.

alone, but aesthetic, political, and epistemological ones, demanding a more situated and critically aware approach to dance-tech practices. These findings extend Rixon's framework through the recognition that symbiosis isn't simply harmonious integration; rather it is an ongoing negotiation. The interdependence Rixon identifies operates through friction, resistance, and the exposure of incompatible logics, as much as through productive collaboration.

Perhaps most significantly, the temporal architecture that emerged from these works reveals an incongruence in existing analytical frameworks. Dance works involving digital technological systems require fundamentally different analytical approaches than traditional dance analysis, which assumes unified temporal progression, in order to facilitate what Haraway terms "polytemporal, polyspatial knottings".²¹² This reveals choreography and technology as co-evolutionary rather than oppositional systems and provides an insight into the mechanics of "expanding the transformational capabilities of the system or developing new re-organisations of the body and its expressive metabolism".²¹³ Simultaneously, it exposes the power dynamics embedded within these transformations. For instance, the agency paradox in works like *Traversing Spaces* demonstrates that this is not harmonious, but contingent, and can be impacted by the onboarding and post-experience structures that frame the work as much as by the choreographic score itself.

These theoretical frameworks shed light on why the non-linear, dynamic process of art making in this space is challenging both practically and theoretically. Sullivan et al., note that although "artistic creation is a messy space filled with wicked problems",²¹⁴ this is an opportunity, not a criticism. It means that that the space hold boundless opportunities to create in ways that are not bound to formal conventions or linear structure and through these newly imagined environment, we may start to know dance differently.²¹⁵²¹⁶ For choreographers, this means acknowledging technology as more than a tool in the process, but as a collaborative agent with its own form of agency. Conversely, technologists must

²¹² Haraway, *Staying with the Trouble*.

²¹³ Birringer, 'Choreographic Performance Systems', 474.

²¹⁴ John D. Sullivan et al., 'Embracing the Messy and Situated Practice of Dance Technology Design', *Proceedings of the 2023 ACM Designing Interactive Systems Conference*, 10 July 2023, 1395, <https://doi.org/10.1145/3563657.3596078>.

²¹⁵ Ibid.

²¹⁶ Laura Karreman, 'Worlds of MoCap', *Performance Research* 20, no. 6 (2015): 35–42, <https://doi.org/10.1080/13528165.2015.1111049>.

recognise that systems are not neutral but carry implicit choreographic assumptions that shape creative possibilities. In acknowledging this messiness, the tensions between, for instance choreography as disruption and control, can be navigated. The research suggests that choreographic systems operate precisely through this dynamic contradiction.

Through each individual work, the connective tissue of the research is borne out. Rather than generalising these findings, the research suggests that through iterative, micro investigations, a conceptual framing emerges. This chapter has begun to articulate a conceptual vocabulary for extending existing research at the intersection of dance and digital media, through practice. It draws out limitations in both systems and exposes points of friction, finding resolution in resistance, reinforcement, and transformation. Choreography then is not just an aesthetic practice, but an epistemological mode. In their systematic mapping of technologies that support choreographic composition, Dornelas, Seabra and Souza acknowledge that artists must be included at the early stages of technological modelling.²¹⁷ This research demonstrates why: choreographic practice interrogates computational systems' epistemological foundations, exposes cultural assumptions and generate new forms of knowledge through the "multi-layered, multi-modal and multi-authored"²¹⁸ processes I have described. These processes are not simply the application of technology to dance, but investigations of technology through dance, positioning choreography as a critical methodology for ubiquitous computation. Its contributions to how we theorise and practice in this interdisciplinary space offer fertile ground for investigation.

2.8 From Choreographic Systems to Choreographic Bodies

As the work above illustrates, when choreographic agency is distributed across human performers, algorithmic systems and computational temporalities, humanist frameworks, which privilege bounded bodies, prove inadequate. Chapter 3 builds on these findings and engages posthumanism to examine how choreographic–technological bodies operate in performance.

²¹⁷ Dornelas et al., 'Systematic Mapping of Technologies for Supporting Choreographic Composition', np.

²¹⁸ Karreman, 'Worlds of MoCap', 42.

Chapter 3. Posthumanism and Somatic Chora

3.1 Introduction

This work, as yet untitled, developed out of a collaboration with scenographer and digital artist, Robin Krijgsman. Based in Utrecht in The Netherlands, this (inter)national and (inter)disciplinary collaboration is framed through the notion of the inter, or that which exists between. As such, it is conditioned by the circumstances of its emergence. It consisted of three phases, each of which will constitute its own section in this chapter. It sought to explore the reciprocal relationship between temporal formats, dynamic environments, and choreography within the context of a physical-digital integration. The research process aimed to explore how choreographic and scenographic systems can set the conditions for the emergence of the work and considered the formation and dismantling of spatial environments through the movement of bodies. Additionally, we conceptualised non-spaces, negative spaces, verticality, and sensorial movement to facilitate the dissolution of boundaries between performer, audience, scenography, and space. This interdisciplinary process merged choreographic practice with immersive scenography, incorporating cutting-edge technologies and experimental approaches to redefine relationships within the performance space. It built on experimental dance works such as Sophia Lycouris' *City Glimpses* (2013),²¹⁹ Wen-jinn Luo/Scarecrow Dance Company and Lien-chang Wang's *Unbreakable.City* (2014),²²⁰ and BANDALOOP's *Dancing on a Skyscraper* (2016),²²¹ in a practice-led inquiry into the performing body as a site of relational transformation. These three works were selected for their shared concern with the performing body as a site of spatial threshold-crossing, in which the dissolution of conventional boundaries between performer, audience, and environment is itself the choreographic subject. These works also resist conventional theatrical containment. The fragmented structure, improvised spatial responses, and dual audiences (live and streamed) in *City Glimpses* offered the project a dramaturgical arc and demonstrated that choreography can operate simultaneously across ontologically distinct spaces without resolving the tension between them. *Unbreakable.City*'s conceptualisation of two cities that mirror each other informed the relationship between realities in this

²¹⁹ Sophia Lycouris, *City Glimpses*, 2013, <https://www.research.ed.ac.uk/en/projects/site-specific-choreographic-project-city-glimpses/>.

²²⁰ Scarecrow Dance Company et al., *Unbreakable.City*, 2014, <https://www.scdc-dance.com/performance-single.php?id=3>.

²²¹ BANDALOOP, *Dancing on a Skyscraper*, 2016, <https://www.bandaloop.org/urbanmodern>.

work by offering a structure that resisted hierarchy and treating these spaces as co-constitutive of each other. Finally, *Dancing on a Skyscraper* reimagines where dance takes place, and how the viewer's perspective redefines the relationship between movement and gravity.²²² This directly anticipated *Untitled's* interest in how the body's spatial coordinates are destabilised through the rupture of cohesive spatial logics.

3.2 Phase 1: The physical-digital performance landscape

The first stage of this research was conducted in studio in Dance House in Dublin in January 2024. As with all of the works created as part of this PhD research, its creative methodology is aligned with Butterworth's choreographic process and Skain's ethnomethodology.²²³ Its iterative nature, characterised by rapid prototyping and continuous refinement, is evident both at a micro level (i.e. within each separate phase) and at a macro level, from phase to phase. Prior to the beginning of the process, we developed a reflective questionnaire to record the development of the work (see Appendix F). This tool was used throughout phases one and three (where Robin and I worked collaboratively) and formed a critical element of the working day. By dedicating 30-40 minutes at the end of the session, it offered a space to interrogate both what had happened in the studio that day and to identify how the collaboration was progressing on an interpersonal level – where points of tension had arisen, and how these might be addressed. It also facilitated a critical assessment of daily outcomes, allowing for a quick feedback loop through which we could make immediate adjustments to both physical and virtual components.

3.2.1 Conceptual development

Prior to beginning work in the studio, Robin and I held several development meetings, where we identified similar conceptual preoccupations. These primarily revolved around ideas of spatial animation through kinaesthetic response; said differently, it concerns how spaces can be enlivened by the presence of choreographed bodies. This is admittedly a very broad remit, and to begin refining the process, we distilled the research into three broad questions:

- 1) What is the in-between, or the inter, in this process?

²²² Amelia Rudolph, *Dances into Thin Air*, 2016, 15:44, <https://www.youtube.com/watch?v=9tgE9dddKtA>.

²²³ For further detail, see the introduction.

This includes the space between performer and audience; the body and the head, which can be disconnected through the use of VR technology; the physical and the digital; light and dark; hidden and exposed; two-dimensional and three-dimensional. Equally, understanding a convergence in function between VR and the stage as liminal spaces which offer an alternative to our own daily reality and in which time and belief are suspended, underpins this question. This breeds a further investigation – how can moving between these spaces be read as a dramaturgy?

- 2) How can technology be conceptualised as a performer, and how does it engage with ideas of the in-between?

In engaging with technology, the possibilities for staging and engaging the conceptual and aesthetic underpinnings of the work are endless. How do they create meaningful relations to each other and through time? How do they relate to the performing body? Why do we, as makers and audiences, always feel that we have to know the technology intimately?

- 3) Micro to macro – how can a play on perspectives open new choreographic and scenographic potentialities?

Bodies are tools of seeing and attentional direction, though often this is what is understood as being asked of the audience. How can this be reframed so that the performing body becomes the instrument of seeing, rather than being seen? How can the dynamic interplay of movement and light offer ways of showing or not? How do these compositions change through the insertion of the audience?

Perhaps the most important facet of this phase emerges as the conceptualisation of space. It is important to consider the precise way in which the word is employed in this creative process. For visual theorist W.J.T. Mitchell, the distinction of space and place is of crucial importance because it infers a distinct set of transformational conditions. He proposes that,

..the most straightforward beginning would be provided by Michel de Certeau, who divides the “field” between space (espace) and place (lieu) in terms of a whole series of binary oppositions. Place is associated with “stability,” “the law of the proper,” and the specific, definite location. Space, by contrast, exists when one takes into consideration vectors of direction, velocities, and time variables. This

space is composed of intersections of mobile elements...In contradistinction to the place, it has thus none of the univocity or stability of a “proper”.²²⁴

In other words, space is consciously brought into being and activated through movements, actions, narratives, and signs.²²⁵ The final pillar of this dialectical triad, according to Mitchell, is landscape. It constitutes “the first cognitive encounter with a place, and an apprehension of its spatial vectors (thus, an appreciation of landscape may well include a reading -or an inability to read- its narrative tracks or symbolic features)”.²²⁶ Mitchell’s assertion that landscape can be understood as “that site encountered as image or “sight””²²⁷ positions the human at the apex of this trifecta. An image requires a viewer, not simply with the appropriate perceptive organs, but with the capacity to recognise, relate to and conceptualise patterns as they emerge. This assumption is, however, challenged by the emergence of computer vision and machine learning. Through training, technological systems at the core of much of the hardware used in this process shift it from prosthesis to creator, through the generation of digital landscapes. This is to say that the technology functions not only as a way of “seeing” but is actively engaged in the creation and perception of space through its internal schemas.

3.2.2. In Studio – Physical/Digital/Hybrid

A sculpture by Irish artist Joseph Walsh, entitled *Magnus Modus* (see Figure 12) provided an aesthetic impetus for generating a scenography. We made a maquette of the studio space (see Figure 13), incorporating a type of structure inspired by *Magnus Modus*. As we could not scale this into the physical studio, we replicated it in a virtual environment, using social VR platform Resonite (see Figure 14).²²⁸ Using what was available to us in the physical environment, we incorporated a ballet barre into the digital sculpture to create a continuity between worlds and to provide perspective (see Figure 15), bringing

²²⁴ W. J. T. Mitchell, ed., *Landscape and Power*, 2nd Edition (The University of Chicago Press, 2002), viii.

²²⁵ Mitchell, *Landscape and Power*, 265.

²²⁶ *Ibid*, x

²²⁷ *Ibid*, x

²²⁸ Social VR is a web-based platform which enables the creation of virtual environments in real time alongside other users from across the globe. It requires a constant internet connection, and the VR headset must be always tethered to the desktop. Resonite specifically offers a more embodied approach to world creation as the user develops the environment whilst wearing the VR headset, and the controls for painting, drawing etc are all contained within the hand controllers. For example, this means that if you wish to draw a line and then scale it to room size, the embodied action involved in this includes grabbing the line at each side (with the controllers) and then physically opening the arms as though stretching a piece of string.

the work into the realm of mixed reality.²²⁹ Additionally, through using VR technology, we could expand the possibilities of the physical space. For example, we could not access vertical space in the studio, but this became possible in VR. What became apparent as the week progressed however was that the one-to-one tracking was not operating properly, and so we were playing with an incomplete layering of space.



Figure 12: Magnus Modus. Joseph Walsh, 2017. National Gallery of Ireland

²²⁹ Mixed reality is distinct from virtual reality as it straddles both the physical and the digital, often through the engagement of multiple senses via spatial audio, haptics, other bodies, etc. It is also referred to as a hybrid space, and these terms will be used interchangeably throughout.



Figure 13: Maquette

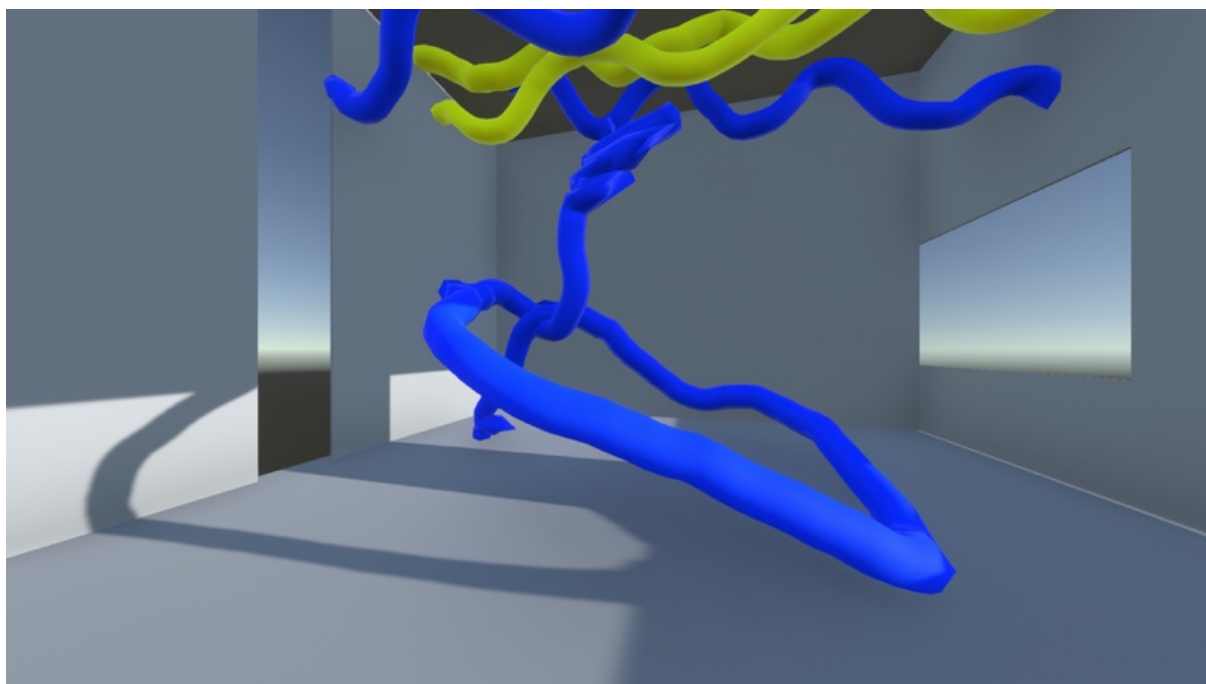


Figure 14: Internal world, built in Resonite



Figure 15: Studio configuration with ballet barre.

In leading the project development with the design of space, it became clear that thinking about the body in relation to a specific object (in this case the digital sculpture) was an entirely new way of designing movement for me. It was almost like choreographing a pas de trois, where space and time are the silent partners. Its function became dualistic, in that it operated as both an investigative tool and a research outcome. The body was both enlivened by and giving life to the space. The notion of spatial dialogue holds some resonance with work by theatre scholar Amy Strahler Holzapfel. In her chapter entitled “From landscape to climatescape in contemporary dance theatre”,²³⁰ a similar question is posed to a series of dance artists and collectives. For Strahler Holzapfel, answering the question of how “...renegotiations of body and/as space, corpus and/as environment, work to destabilise the still lingering opposition between figure and

²³⁰ Strahler Holzapfel, ‘From Landscape to Climatescape in Contemporary Dance-Theater’.

ground”²³¹ points towards a sort of fusion between body and space, where both elements give rise to and emerge from, each other. To put this differently, the performing body functions as an embodied interface; as both landscape and navigator, simultaneously constructing and traversing physical and virtual terrains. Understanding physical movement as a link between space, time and environments expands the conceptualisation of the physical body into contemporary notions of posthumanism. In critical theory, the posthuman condition rejects the nature-culture continuum, which posits a categorical distinction between the given (nature) and the constructed (culture). This binary facilitates the study and critique of the social mechanisms that support the construction of identities, institutions, and practices, but posthuman theory resists this, proposing instead a non-dualistic understanding of the nature-culture interaction. It argues that these categorical boundaries have largely dissolved because of technological and scientific advances, and therefore a new, subjective theory that acknowledges our entanglement with material and relational contexts is key to the navigation of the complexities of contemporary existence.

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Practically, maintaining an embodied perspective during the process required thinking through how virtual spatial exploration mapped onto physical choreographic principles. Some useful strategies emerged. Firstly, understanding that whilst in theory the virtual space is unbounded by the same constraints as physical space, there are still limitations. In this research phase, they included both the boundary of the predefined play area and, as the headset required constant tethering, the length of the link cable. However, taken together with the digital sculpture they offered a sort of choreographic score, guiding and shaping the movement as I explored the virtual space. Secondly, in scaling the spatial dynamics, I was able to induce various movement qualities. Thirdly, the latency that was introduced into the space through the introduction of external cameras structured the choreographic timing as the work progressed. All of these experiences become somatic memory, which can be transposed across realities and bodies. Their integration requires a re-evaluation of how they change the means through which the body-space negotiation can be read and understood.

On reflection, the role of the performative body in the generation of space in the work is clear, but throughout the early phases of the work, it was, at times, obscured. This

²³¹ Ibid, 402.

²³² Braidotti, *The Posthuman*. The implications for this finding are detailed in Phase 3 below.

issue is also a function of interdisciplinary creation. As in interdisciplinary research, it requires all parties to lead with openness not only to ideas, but in allowing established disciplinary methodologies to be malleable to the insertion of the other in the generation of a novel way of working.²³³ It requires great trust in the capacities of both the self and collaborators, along with a tolerance to risk. To interrogate this with regard to the research process, the lack of clarity regarding the specific role of the performing body and its choreography became a challenge to be managed. This was resolved through dedicating time each day to physical, embodied explorations of both the digital and physical spaces, from which the conceptual haze began to clear.

Moving beyond the spatial design and embodied exploration, we began to generate layers in the environment through the introduction of a webcam and iPhone camera. This decision resulted from the desire to create a visual coherence between worlds. Practically, this involved setting up the two cameras in the studio and finding a way to stream them into the virtual environment. By placing one camera on each side of the environment, we removed the hierarchy of the gaze. As there was no local streaming capacity on the studio network, the most effective option to achieve this was to use Twitch, an online video livestreaming platform that facilitates real-time streaming of games, music, sports and events, amongst other things.²³⁴ After setting up an account, we were quickly able to stream live studio footage into our virtual environment through Resonite.²³⁵ Whilst Resonite allows you to control who can enter your virtual environment, the Twitch livestream had to be set to “public” in order for it to be a compatible Resonite input. As a result, our Twitch livestreams were public, indicating a potential other observing the goings on in studio at any given moment from anywhere in the world.²³⁶ Unexpectedly, it became a first step to bringing outsiders into the process despite the decision to leave the audience outside of the studio in favour of considering our own relationality to the space during this phase of R&D. Internally, in the virtual world, questions of watching and being watched were already being engaged thorough

²³³ Allen F. Repko and Rick Szostak, *Interdisciplinary Research : Process and Theory*, 4th edn (SAGE Publications Inc, 2020).

²³⁴ ‘About’, Twitch.Tv, accessed 8 February 2026, <https://twitch.tv/p/about/about/>.

²³⁵ Resonite allows third party streaming into virtual environments, but this requires a strong and stable internet connection at all times.

²³⁶ Just because all livestreams are public does not mean that all livestreams have an audience. It does however mean that the *potential* exists for others to engage with the work without our explicit consent. Equally, you could make the argument that through choosing to use Twitch in this knowledge, consent is implied.

the acknowledgement of another in physical reality, but the addition of Twitch livestreaming engaged this idea in the physical space also. Ultimately, it highlighted the question of visibility: who is watching and who is being watched? It also generated another interesting creative layer unintentionally. Because of the slow internet download speed, the Twitch data feed in Resonite, and thus in the virtual world, lagged by several seconds. To test the implications of this, I immersed myself in the virtual world by putting on the headset and beginning to explore the newly augmented space. I caught glimpses of my “outside” self in the video feed that was projected into the digital space, but due to the lag, I was in fact watching my past self. The fracturing of perspective through multiple camera angles also led to the fracturing and layering of time and brought relevance to the visual component of the space. Additionally, it generated proximity and intimacy through the performative body (live or streamed). During this exploration it also became apparent that the desire to observe yourself necessitates movement, but the observation of such requires a total slowing down of the body. This is to say that when confronted with an image of the self, movement is provoked to generate a response and to understand whether the image is live or static. Conversely, to closely observe the self, a stillness is required. This tension creates a perpetual oscillation between action and perception, where the body simultaneously functions as both the subject performing movement and the object observing that movement.

This insight regarding the porous nature of physical and digital reality became a primary focus of the work. To test the boundaries and fluidity, we decided to add another body to the space (not in VR)(see Figure 16). Could the VR controllers (held by the person in physical reality) be used to create a relational proximity and exploit the porosity of the two worlds? In separating the headset and controllers and using only one component per person, we fundamentally disrupted the technological construction of the body by fragmenting its sensory and motor functions across multiple individuals. VR systems traditionally construct a coherent virtual body schema by mapping head movement (through cameras on the headset) and hand movement (through sensors in the controllers) to a single user. When disrupted, as is the case here, the body emerges as collaboratively constructed between users, regardless of whether they are performers or observers. The body becomes co-created, reinforcing relational interdependence and illuminating the role of kinaesthesia in linking spaces.²³⁷ It also led to a refined research

²³⁷ See video here: <https://youtu.be/dn5iQPvzR70>

question: what is the choreographic mechanism through which two bodies in motion form a porous membrane between digital and physical realities? How does this research question engage an audience? In what format? Through which channels? In trying to answer this question, we experimented with anchoring through the hands. Participant 1 (headset wearer) was fully reliant on participant 2 (hand trackers) to illuminate the virtual space for them.²³⁸ What happened when this composite body began to explore the space was fascinating. Whilst participant 2 held the tools to reveal the virtual space, they could not see it as they were not wearing a headset. They were reliant on participant 1 to transmit a representation of that space to them, through this one point of contact. It became clear that the body acts as a membrane through which images and experiences can pass from one reality to another, and from one body to another. The two bodies in space become their own kinetic sculpture, creating visceral images that traverse a whole spectrum of realities.²³⁹

²³⁸ We darkened the virtual space and attached a light to the trackers, which then illuminated the space.

²³⁹ See video in Appendix D



Figure 16: Caoimhe & Robin in studio. Note here the separation of headset and controllers

During this same phase, the virtual environment was extended, and a reactive audio component was added to drive the dramaturgy of the work. Though the audio was spatialised through Resonite, it was only audible through the speakers in the headset.²⁴⁰ This was not the initial intention; however, the integration of a soundscape into the work was designed as a linking mechanism between worlds and participants. Early in the development, the sound system (streaming from Resonite into localised Bluetooth speakers) stopped cooperating, and we had to shift to headset sound only. As a result, we ruled out the option of using sound in this way further down the line as it decreased the shared experience and reduced overall engagement with the broader composition. Further,

²⁴⁰ OGG files were uploaded to Resonite and colliders were built into the virtual space so that sound was triggered when the controllers came into contact with these components.

the failure to unify spaces through this strategy (after extensive troubleshooting) led us to spend time identifying several other strategies; these included touch and light, both of which we included in our testing later on.

Scenographically, we continued to manipulate the virtual spatial environment through changing the shape and material of the sculpture, the sonic dimensions, camera angles and presentation in the virtual space.²⁴¹ Choreographically, we altered the dynamism of movement quality to explore how the body interacted with the mixed-reality environment, and to interrogate the scenographic-choreographic interaction. This was broadly based on the systematic variation of movement qualities as defined by Laban Movement Analysis (LMA) principles—specifically weight, time, space, and flow.²⁴² Additionally, our methodology employed what we termed "spatial provocations"—deliberate modifications to both physical and virtual environments designed to elicit specific movement responses. For instance, altering the scale and proximity between physical and virtual elements challenged proprioceptive awareness, and altering the capacity to physically cross but digitally reinforce virtual boundaries using the pass-through function played further on this notion of permeability.²⁴³ Technically, this was a challenge as it became apparent that the pass-through boundary could not be made any less visible (by making it less opaque, for instance) without removing the pass-through function.

Across this R&D phase, an iterative process of continued exploration and refinement began to emerge as our *modus operandi*. A quick feedback loop helped to make detailed adjustments, and the exclusion of certain conceptual and practical potentialities narrowed and deepened the areas of emerging interest. For instance, we ruled out anything that needs to be streamed through a local network; prerecorded mocap data; aesthetic or thematic experimentation in favour of temporal embodied experimentation and the notion of a “performer” in space, i.e. a choreographed body in favour of a choreographed space. Considering the interdisciplinarity of the project as a sort of liminal space, the melding of creative practices, working practices, aesthetics, and theoretical frameworks, amongst other things, delivered some challenges. A lack of clarity

²⁴¹ Specifically, we altered the appearance of the virtual sphere, screens and floor.

²⁴² For an in-depth analysis of this process, see chapter 1.

²⁴³ The pass-through function enables the headset wearer to shift from virtual space to physical space by tapping the side of the headset.

at the beginning of the week around the desired outcomes of the research period was somewhat frustrating, but a re-evaluation highlighted the need to slow down a little and allow a new creative process to emerge from the studio. An acceptance of an open-ended research phase, as opposed to an outcome driven one has been important for us both, given the tendency to jump into “production mode” from the off.²⁴⁴ A mid-week check-in provided some resolve regarding the melding of practices, and a stronger understanding of the conceptual basis as it emerged from the exploration took some of the practical pressure off. The feelings of insecurity and not knowing (borne out through new geographical environment and new collaborative practice) were managed through respect, empathy, generosity, patience and finding comfort in the unknown. Towards the end of the week, it was clear that we were moving towards a work that held value in its sharing with spectators. However, rather than allowing this status to shift the process into production mode, it took a conscious effort to hold this idea of research, experimentation and exploration close. A key insight was accepting this as a process-driven investigation; while process and product need not be mutually exclusive, the focus had to remain centred on the unfolding methodology rather than fixed endpoints. This was a particularly challenging construct to manage, as it illuminates a tension between artist and researcher. The artist wants to make an artwork, a self-contained creative expression of an idea, with clear aesthetic and formal parameters. In other words, a “finished thing”. The researcher however wants something different. The researcher wants to generate new knowledge about the idea, through asking a series of questions, whose answer is articulated through practice. The challenge here is that these answers are messy, aesthetically and formally, and challenge the artist’s sensibilities. This conundrum has no definitive solution, only the ongoing practice of process reflection and the willingness to attend to whatever dimension of the artist-researcher role requires attention in the moment.

3.3 Phase 2. (de)(re)construct

The second phase of this work was undertaken alone. It forms a short choreographic study on film of some principles that emerged from the first phase of research and was screened in the Irish Embassy in Paris in July 2024 as part of the SPACE Artist Residency. The work is grounded in a choreographic score (see Figure 17), written in

²⁴⁴ In my experience, this tendency is largely due to the pressure that is exerted through the arts funding models operating in Ireland. For independent artists (as distinct from artists and organisations that receive strategic funding), they are project-based, prioritising public-facing outcomes over research and development.

response to the first part of the research process, and shaped by its somatic memory. It distils aesthetic components from the research process (undefined space, texture, light and dark) and attends to some key choreographic findings. These catalysed around three choreographic ideas: spatial dynamics; temporal distortions; and composite bodies.²⁴⁵

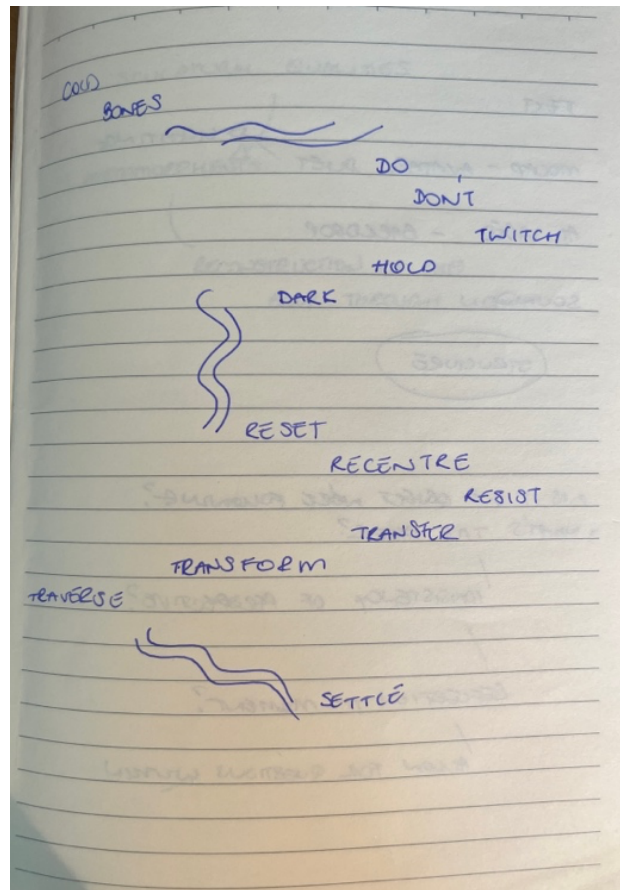


Figure 17: Score.

In finding a creative expression of these research outcomes, I began by asking what it means to choreographically formulate a composite body. What are the visual principles that are necessarily borrowed in the filmic deconstruction and reconstruction of the body? How can this be performed? The process of choreographing a body in three-dimensional space, with the intention of representing that on film, which is a two-dimensional space, required a consideration of the framing of the images. This began by constructing a frame-by-frame storyboard, thinking through how the body might be considered *as* space, rather than just *in* space. The body-as-space conceptualisation

²⁴⁵ See here for full video: [\(de\)\(re\)construct.MP4](#)

allowed me to consider where in the body interesting spaces might exist. For instance, the indent of the clavicle; the a-frame of bent knees or the convex curvature of the spine. From there, I began introducing a focus on textures, reminiscent of those established during the research phase. This included tools such as a focus on skin and hair textures, the introduction of fabric, and textured light, including projection onto the body, and shadows. Minimal camera motion allowed the movement to be driven by the body, the camera operating only as a viewpoint into its construction. The editing process added a further layer to this, incorporating techniques including jump cuts and overlays, the intention of which was to disrupt the continuity of the movement. The choreographic decision to engage with temporal disruption was borne out through the incorporation of slow-motion, repetition and looping movements, which deconstruct linear time, echoing how digital environments reshape bodily perception. Throughout the film, the body's interaction with light, projection and shadow create an interplay between material and immaterial form, denoting the dissolution and reconstitution of boundaries between realities. Similarly, the lack of a distinct scenography here (in contrast to the earlier research phase) reinforces the body as the primary site of transformation, allowing movement to shape the space rather than the inverse. As the film comes to a close, the fragmented body begins to become whole, reclaiming a sort of tangible, embodied presence. Its arc ultimately moves through a process of fragmentation and negotiation in search of a resolution.

Moving towards the next phase of research, some useful reflections on this short process emerged. In engaging with ideas of a composite body, attentiveness to the specificities of each part rooted me back in the domain of the somatic. Ironically, attempting to choreographically deconstruct and then reconstruct the body only heightened the embodied nature of the practice, indicating that despite the constant flux of perception, agency and presence induced by hybrid spaces, the body can remain whole. Light was a useful strategy for engaging ideas of presence and absence. Shadows provide a wonderful opportunity to allow audiences to project their own selves and imaginations into an often-impenetrable creative object.

The fragmentation work of this phase raised questions that required some conceptual scaffolding beyond practice insights. What is this site of negotiation wherein the body is simultaneously distributed and persistent, shaped by and shaping its environment? Building on Mitchell's landscape framework, Strahler Holzapfel's work

offers a starting point, proposing an evolution towards what she considers to be a more holistic approach to the relationality of humans to their environment.

3.3.1. Theoretical Interlude: Towards a Somatic Chora

Proposing “climatescape” instead, for Strahler Holzapfel, “the very word “land” feels oddly antiquated in comparison to “climate”, which encompasses a sense of humans in relation to a larger, planetary spatiotemporal “scape””.²⁴⁶ It is logical then to assume the existence of dance within in this “scape”; it is, after all, the expressive engagement of a body, or bodies, with space and time. Its organisation is known as choreography, and though it is briefly noted within Strahler Holzapfel’s chapter in reference to the writings of dancer and scholar Susan Leigh Foster, the acknowledgement of the root of the term “choreography”, stemming from “chorography” warrants some further attention.²⁴⁷ The emergence of the term “landscape” requires some excavating, for its evolution, as proposed by Strahler Holzapfel, is inherently linked to its conception.

Landscape has long been the locus through which geography and the humanities intersect, as it forms a key concept across some geographical traditions, as well as in the visual and literary arts. This can be traced as far back as Homer, Herodotus and Strabo, for whom the marriage of geography and history became chorography, and were “...primarily seen to be topics for writing, which is to say, language and discourse”.²⁴⁸ Though landscape has been understood, at times antagonistically, as both as an area or region and a visual form of representation, Olwig notes that with the interjection of the idea of chora, from both ancient Greek and Plato’s *Timaeus*, “there is, in fact, no necessary opposition between landscape defined as a region or country and its pictorial representation as a prospect of that place”.²⁴⁹ In Plato’s *Timaeus*, he explains the birth of the cosmos, telling the story of how “temporal worlds arose from the eternal”.²⁵⁰ In it, Plato describes how Demiurge, the architect of the physical world, brings it into being in the likeness of eternal forms. Two distinct entities, the physical world is a copy,

²⁴⁶ Strahler Holzapfel, ‘From Landscape to Climatescape in Contemporary Dance-Theater’, 401.

²⁴⁷ I am not proposing here a full historical and philosophical analysis of the etymology of the word; simply that some further historical context is useful in considering the role of linguistic framing, and how it shapes the understanding of hybrid spaces in this work.

²⁴⁸ Kenneth R. Olwig, ‘Choros, Chora and the Question of Landscape’, in *Envisioning Landscapes, Making Worlds: Geography and the Humanities*, ed. Stephen Daniels et al. (Routledge, 2011), 46.

²⁴⁹ Olwig, ‘Choros, Chora and the Question of Landscape’, 51.

²⁵⁰ Rebekah Sheldon, ‘Form/Matter/Chora: Object-Oriented Ontology and Feminist New Materialism’, in *The Nonhuman Turn*, ed. Richard Grusin, Center for 21st Century Studies (University of Minnesota press, 2015), 211.

or a representation of the eternal. Plato then describes a third element which is neither the *eidos*, eternal and unchanging, nor the physical world. This third kind, or *chora*, “is the spacing which is the condition for everything to take place, for everything to be inscribed”.²⁵¹ It functions as a sort of philosophical conundrum, wherein the binaries of being (eternal) and becoming (temporal) are held in tension. The *chora* disrupts this binary by functioning as a dynamic, generative realm “that holds together and disrupts the movement from potentiality to actuality, swerves the smooth transition from model to copy and offers a notion of systemic agency that operates in the interstices between objects”.²⁵² In other words, the *chora* facilitates metamorphosis, though it exerts its influence indirectly causing mutations during the process, leading to an imperfect reproduction.²⁵³

The proposition here is that the *chora*, which by Plato’s own account is perceived by a kind of “bastard reasoning”²⁵⁴ because it destabilises his systemic logic and is irreducible to either polarity, is, in effect, a hybrid space associated with chaos, potentiality and materiality. For Derrida, the instability of both the individual word and the concept, raise the question of interpretation of language. This requires analysing the nature of the *chora* in its ordinary, everyday usage in ancient Greece, meaning, amongst other things, “place”, “location”, “site”, “region” and “country”, in the sense of the land of a people.²⁵⁵ Attending to the role of humans in the delineation of space implies an active organisation, that “the ordered polysemy of the word [*chora*] always includes the sense of political place or more generally of invested place, by opposition to abstract space.”²⁵⁶ Derrida resists the anthropomorphisation of the *chora*, instead pushing its conceptualisation towards an understanding of space and subjectivity as mutually constitutive.²⁵⁷ A step further, Lukermann in Olwig, following Plato, writes that “choros technically means the boundary of the extension of some thing or things, it is the

²⁵¹ Derrida in Derrida and Eisenman, *Chora L Works: Jacques Derrida and Peter Eisenman*, 10.

²⁵² Sheldon, ‘Form/Matter/Chora: Object-Oriented Ontology and Feminist New Materialism’, 212.

²⁵³ The understanding of the *chora* as a medium (and agent) of transformation is analogous to that of the womb of the biologically female body – the *Timaeus* itself speaks of “mother” and “nurse” as metaphor in regard to the *chora*. While a feminist critique of this interpretation falls beyond the remit of this chapter, the work of theorists including Judith Butler and Elizabeth Grosz challenge this from a feminist perspective.

²⁵⁴ Jacques Derrida, ‘On the Name’, ed. Thomas Dutoit, trans. David Wood et al., Stanford University Press, 1995, 125.

²⁵⁵ Derrida in Derrida and Eisenman, *Chora L Works: Jacques Derrida and Peter Eisenman*, 16.

²⁵⁶ Derrida in Olwig, ‘Choros, Chora and the Question of Landscape’, 49.

²⁵⁷ Derrida and Eisenman, *Chora L Works: Jacques Derrida and Peter Eisenman*.

container or receptacle of a body”²⁵⁸, which aligns with the Ptolemaic cartographic understanding of “chorography”. Through this framing, chorography, or the practice of mapping, describing and interweaving spaces along the boundaries of their regions in service of a regional whole begins to reveal the nebulous, co-constructed nature of the chora and relational ontology of space, place, and being. In his analysis of the writings of Heidegger and Nishida on chora, Krummel concludes that:

The in-formation of chōra happens not through the impression of paradigms from a transcendent sphere but rather through social history, the interaction of human beings amongst themselves, with the world and with nature, and who themselves emerged from out of this process. This tense unfolding of the world vis-à-vis nature and her very materiality, her appropriations by and resistance to our imaginary constructions or formations, defines our existence, the spatiality of our being that we can understand in terms of chōra.²⁵⁹

Here, Krummel reinforces the idea that chora is grounded in the everyday; that although it resists definition, it functions as the generative spatial condition through which existence is continually recontextualised.

If chora provides a dynamic, non-anthropocentric framework for synthesising the opposing schools of thought on the foundational conditions of landscape as a meaning-making system, then it is reasonable to argue that it aligns quite closely with the notion of climatscape, as outlined by Strahler Holzapfel. Of note however is that while Strahler Holzapfel’s conception of climatscape acknowledges “the fragile interconnectedness and interdependency between bodies and spaces, figures and grounds”,²⁶⁰ is fundamentally linked to climate breakdown, and a future where “there will cease to be a figure to choreograph in relation to a ground”.²⁶¹ Though her initial framing appears to decentre the human focusing instead on a systemic whole, on reflection, this is only partially accurate. The focus on a future where the earth we inhabit can no longer sustain bodies as a result of climate change is inherently linked to human action and inaction, revealing once again its anthropocentrism. Chora, by contrast, offers a model of body-spatial

²⁵⁸ Olwig, ‘Choros, Chora and the Question of Landscape’, 50.

²⁵⁹ John W. M. Krummel and Romanian Society for Phenomenology, ‘Chōra in Heidegger and Nishida’, *Studia Phaenomenologica* 16 (2016): 513, <https://doi.org/10.5840/studphaen20161618>.

²⁶⁰ Strahler Holzapfel, ‘From Landscape to Climatscape in Contemporary Dance-Theater’, 417.

²⁶¹ *Ibid*, 423.

relations whose coherence is not reliant on human (in)action as the generative disruption it names operates regardless of human presence.

Through the broad intersection of chora and climatescape as relational fields where forms arise through contingent forces, the body can likewise be understood as a responsive site, or a somatic chora, where sensory, spatial, social and technological conditions are continually negotiated.²⁶² If chora is understood as the precondition for spatial formation, then the body may be approached as a kind of living chora, “the place where something “other” breaks in, always upsetting our neat conceptions of what might be possible or impossible”.²⁶³ For Derrida, movement is a key means through which destabilisation of boundaries, and thus transformation and transcendence are articulated. His use of processual terms such as *coming*, *turning*, *flowing*, and *burning* points to the catalytic function of chora and underscore its relevance as a framework for analysing the spatial and bodily dynamics present in this work.²⁶⁴ Rather than operating as a self-contained subject, the body operates as a membrane, absorbing inputs including light, sound, digital, proximity or memory and enacting this disruptive potential through movement. In this work, choreography does not simply animate the body; it is an activation and reconfiguration of the body as space. It is exposed as a site of emergence, where phenomenological presence is constantly unsettled by technological mediation and spatial instability. There are clear resonances here with theories of the posthuman, in which boundaries of selfhood, materiality and agency are malleable. In this work, the performer is not only a mover, but a node in a larger, distributed system of relational flows human and non-human, digital and analogue.

3.4 Phase 3. A performance of Posthumanism

The final phase of this research project began with an acknowledgement that this period would be rooted in the development of a work-in-progress to be shown to a live audience. The work was to be a continuation of the two prior research phases, building on the key findings and developing these performatively. It sought to test the somatic chora framework by exploring what it might look like when staged for an audience, and how the

²⁶² From here on, I will use the term chora to refer to the generative condition of becoming through which I frame the work, rather than climatescape. This is due to its resistance to anthropomorphisation.

²⁶³ Paul S. Fiddes, ‘The Body as Site of Continuity and Change’, in *New Topics in Feminist Philosophy of Religion: Constestations and Transcendence Incarnate*, ed. Pamela Sue Anderson, Feminist Philosophy Collection (Springer, 2010), 272, <https://doi.org/10.1007/978-1-4020-6833-1>.

²⁶⁴ Derrida, ‘On the Name’.

body's choric function could be made visible through the integration of choreography, scenography and technology.

Conceptually, we decided that the work should be aesthetically driven, as opposed to narratively driven. This allowed us to sink deeper into the enmeshment of scenography and choreography, continuing to allow a new process to emerge and discovering the ways through which meaning could be derived in the in-between space. Light emerged as crucial to this aesthetic drive, its role as choreographic interlocutor having developed across prior phases: from webcam projection creating delayed self-images in Phase 1, through shadow and texture experiments in Phase 2's film work, to the improvised lighting dialogue explored here. Engaging with ideas of the in-between from Greek mythology in both literature and visual art provided a reference (see Figure 18) for the construction of the space in the Beckett theatre, a black-box space housed in the drama department of Trinity College. Conceptualising a hybrid space, we built an architectural element into the black box consisting of a series of black wooden boxes and stairs stacked in a sort of triangular configuration, and two 8ft tall wooden screens, which bounded the space and provided a reflective surface for projection and lighting design (see Figure 19). The lighting set up consisted of three trusses dropped to three metres, with nine LEDs, six profiles on the grid, four on the floor and four floods. The parameters of this newly reconfigured space provided a "play-area" of sorts, from which the outcomes of the previous phases could be iterated upon.



Figure 18: Mourners at an Attic funeral. Terracotta funeral plaque from Attica, c.520-510 BCE. Metropolitan Musuem of Art, New York.



Figure 19: Beckett Theatre configuration.

Choreographically, this phase proved both most challenging and most rewarding. In conditioning the space architecturally, it became apparent that its animation lay in the relationality between body, light, and technology. Following on from the prior research phases, this exploration first began with an improvisation.²⁶⁵ In allowing my body to engage with the space, several key findings emerged. Firstly, as I traversed the new theatrical landscape, Robin improvised with the lighting set up. This became a dialogue of sorts – as I moved, he followed, changing the colour, texture, and shape of the image. At times, the conversational dynamic shifted, exposing the tensions and relations in animating the space through movement and light. As I began to establish a movement vocabulary in relation to the spatial orientation, I began to examine the visual integration of body and architecture, not merely as separate components of the same scene, but from a gestalt perspective, where the image cannot exist without the input of the other. In practical terms, this included strategies whereby the lines of the body mirrored the lines of the object, or an articulation of the contrast between the softness of the body and the harsh lines of the object. Guided by the idea of slowing down and observation, stillness became a means of communicating with an object and with space. These strategies became about the body uniting with the physical space (see Figure 20), unearthing a magnetism between body and object. The choreography in its essence became a duet with the light and space, the body operating both as a connector of elements and being shaped through their properties.

²⁶⁵ See chapter 4 for a discussion regarding the use of improvisation in my practice



Figure 20: *Body as space.*

This reciprocal shaping aligns with contemporary posthuman thought; for Braidotti, posthuman theory is “a generative tool to help us re-think the basic unit of reference for the human in the bio-genetic age”.²⁶⁶ The notion of the “basic unit of reference” refers not only to the disintegration of the nature-culture continuum through the effects of scientific and technological advancements, but to the “—...decentring of “man”, the former measure of all things”.²⁶⁷²⁶⁸ Instead, it contends that the human is, physically, chemically and biologically enmeshed and dependent on the environment, and that this engenders a new form of subjectivity. This positionality resists the strand of analytic posthumanism that is dominant amongst critical, social and science theorists, which often focuses on the dismantling of humanist assumptions without offering a framework for reconstituting subjectivity.²⁶⁹ Instead, Braidotti insists on “..at least some

²⁶⁶ Braidotti, *The Posthuman*, 5.

²⁶⁷ Ibid, 2.

²⁶⁸ This idea of “man” as a symbol of classical humanity is centred on a male, who is white, European, handsome and able-bodied.

²⁶⁹ Analytic posthumanism refers to the understanding of posthumanity as a sociotechnological reality that already exists in the contemporary world and which needs to be analysed. Matthew E. Gladden, ‘A Typology of Posthumanism: A Framework for Differentiating Analytic, Synthetic,

subject position: this need not be either unitary or exclusively anthropocentric, but it must be the site for political and ethical accountability, for collective imaginaries and shared aspirations.”²⁷⁰ In other words, Braidotti is arguing for a rethinking of the human that reflects how we experience, understanding and exist in a radically interconnected world, whilst retains some capacity for political and ethical agency. Though she positions the posthuman as a tool, its use is primarily intellectual, serving to critique and reimagine human subjectivity and embodiment, rather than understanding its underlying mechanics. Reframing the posthuman body as a somatic chora offers a spatial and ontological logic for understanding how embodiment operates. In this way, the posthuman body and the body as chora emerge as complimentary, mutually reinforcing concepts.

The convergence of these two concepts, namely the posthuman body and the body as chora, find material expression in the development of hybrid spaces throughout this research. Rather than positioning the performer as the centralised agent of meaning, the body emerges as distributed, relational presence, shaping, and in turn shaped by its interactions with spatial and technological systems. The layering of virtual and physical space in real time takes shape through the performing body; in phase one, this was expressed through the physical connection of performers, allowing each to experience the reality of the other. In phase three, the performing body was again the conduit through which the virtual was accessed and navigated (see Figure 21), exposing the dynamic field of becoming that it both inhabits and translates. In phase two, the body is literally distributed; singular parts in conversation with light and texture develop a dialogue between the fragmented movement and the environmental systems they activated. These shifting environments reveal the choratic processes at play in the work; the interdisciplinary practices becoming whole. The performing body does not stand apart from its conditions - the space it occupies only exists in so far as a body brings it into existence. It is conditioned by the presence of a physical body.

Theoretical, and Practical Posthumanisms’, in *Sapient Circuits and Digitalized Flesh: The Organization as Locus of Technological Posthumanization* (Defragmenter Media, 2016).

²⁷⁰ Braidotti, *The Posthuman*, 102.



Figure 21: The body as the link between physical and virtual realities.

These theoretical insights found concrete expression in specific choreographic and scenographic decisions. For instance, the act of sitting in performance was designed to function as a connector between audience and performer. This was inspired by the webcam experiments in the first phase, bringing ideas of reflection in the choreography. Costuming became a means through which to root the body into the space; black bottoms rendered the lower body almost invisible when seated or standing on the sculpture. Conversely, the choice of a white top refracted the light, illuminating the space through movement (see Figure 22). This became a foundational principle in the aesthetic compositions that we developed and was informed by the earlier explorations in VR where a light attached to the controllers in VR illuminated the space. Similarly, the physical structure was designed in such a way that it facilitated the disappearance of the

body from certain perspectives, only for it to reemerge.²⁷¹ This device was built on the experiments with the webcam, where the image of self appeared and disappeared.



Figure 22: Refraction of light in costuming.

The dramaturgy of the space became the framework upon which to hang choreographic choices, and these choices were underpinned by our experimentation with time. If the use of technology reconceptualised the performative meaning of time through fragmentation and a meeting of past selves, then reframing this idea as a stylistic device led to engaging choreographically with idiosyncratic elements of dance, from ballet through to postmodernism.²⁷² For example, in the opening image the dancer stands upright in first position on the “stage”, offering the audience a frame through which to view the work. As the work progresses, the clarity in the relationship between dancer and stage (where stage is understood as a host), dancer and time (where time is also timing) and dancer and light (where light functions primarily as atmosphere or illumination) begins to break down, revealing an interconnectedness more typical of postmodern

²⁷¹ See full rehearsal video in Appendix D

²⁷² It is true to say that ballet is not the oldest form of dance, but it is a useful starting point when considering a stylistic, time-based trajectory as its codified nature offers a universal reading.

work.²⁷³ The relationship between dancer and light is expressed through floorwork, in a series of playful back-and-forths where a defined trajectory leaves space for spontaneous movement and lighting improvisation. Similarly, the lighting and meanings encoded within the colour choices become the instrument through which the relationship between performer and space is revealed. The spatialisation of movement, rather than a rigid, step-by-step choreography proved a useful strategy in maintaining an element of risk and tension within the performance. A deep attentional focus was required from all performers in revealing to the audience the quality of the relationships that we had established throughout the research process.

Technically, we reintroduced some components that we had explored at the earlier phase of this research. After the reconfiguration of the black-box space, including iterative changes to the lighting and audio set-up across several days, we began working on a virtual representation of the space. This time, the virtual space was built using Unreal Engine, a 3D computer graphics game engine which facilitates untethered headset usage.²⁷⁴ It contained a representation of the blackbox, but also included a similar, if more refined, digital sculpture. As a whole, this research project proposes a critical creativity²⁷⁵ approach to the integration of emerging technology in performance. In practice, it seeks to understand and offer innovative responses to the why of technological integration in performance. The most significant subversion of technology in this project came about after the first phase of research, where a significant finding regarding the transmission of spatial experience through the body sparked further performative experiments. Often, a VR headset is deployed as a consumer device, meaning that it is worn by an audience as an extension of their reality. Instead of utilising this way, we returned to the question: how do you explore a virtual space through somebody else's body? In attempting to find an

²⁷³ Though postmodern dance is slippery in its definition, its functional relation to its *context* (rather than because of its internal movement qualities, or *content*) was a significant shift in terms of dance theory, aligning it with the contemporary institutional theory of art. For a broad overview, see Sally Banes, *Terpsichore in Sneakers: Post-Modern Dance* (Wesleyan University Press, 1987), <https://doi.org/10.2307/4638306>.

²⁷⁴ 'The Most Powerful Real-Time 3D Creation Tool', Unreal Engine, accessed 8 February 2026, <https://www.unrealengine.com/en-US/home>.

²⁷⁵ Critical creativity here refers to an articulation of the conditions of technology in performance alongside its artistic potentialities, where we seek to challenge assumptions through creative expression. The concept straddles several domains but its emergence in cultural theory studies is perhaps most relevant, where creativity is reconstituted as criticality, and vice versa. Brandon McFarlane et al., 'Remaking Critical Theory: A Creative Humanities Process and Intervention', *University of Toronto Quarterly* 92, no. 2 (2023): 147–81, <https://doi.org/10.3138/utq.92.2.03>.

answer, we decided that the performer should wear the headset, and that the way in which their exploration of the virtual space is communicated was through projection. In other words, the layering of space and time is performed here through technological means, and the context of the device is reconfigured. The function of the device is reimagined as a means of accessing and sharing the experience of the performer rather than a viewing tool for the consumer. In this set up, the body of the performer is the means of exploring another reality, and this forms the creative expression of an in-between world, or chora. This is a new approach to the use of VR headsets in performance, and as a result brought several significant challenges. The first was that the Oculus Quest Pro, which is the model of the headset used in this work did not have a zero point. A zero point refers to the baseline reference point from which the headset takes its spatial calibration, i.e. the point at which the inertial measurement unit reads zero.²⁷⁶ This proved problematic when used in performance, because while the virtual space had been mapped directly onto the physical space, once the headset was moving in a way that challenged its internal sensors, the spatial calibration became distorted and unreliable.²⁷⁷ As the performer was positioned in a multi-level space, the lack of reliability became a safety hazard. The most effective fix for this was for the performer to initiate the pass-through function so that the environment was visible to them as a “cheat”. The benefit in using the Quest Pro was that the virtual space was still overlayed in the headset, and thus the performer was able to engage with and explore this world. Though unexpected, this development further reinforced the primacy of the body as the link between worlds.

The second piece of technology that was introduced at this phase of the research was the Microsoft Kinect. This is a now discontinued motion sensing input device, which utilises RGB cameras and an infrared depth camera, allowing it to perform real-time gesture recognition and body skeletal detection.²⁷⁸ The decision to use this piece of technology stemmed from discussions regarding the role of the audience in this work, and built on phase 1’s exploration of composite embodiment. Phase 1 fragmented the VR

²⁷⁶ The inertial measurement unit is a device which calculates linear acceleration and angular orientation, which alongside inbuilt cameras help to generate a 3D map of the space. Joris Boulo et al., ‘Validity and Reliability of the Tracking Measures Extracted from the Oculus Quest 2 during Locomotion’, *Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization* 12, no. 1 (2024): 2274391, <https://doi.org/10.1080/21681163.2023.2274391>.

²⁷⁷ See Appendix D

²⁷⁸ Andrew Miles, *Culture, Participation and Identity in Contemporary Manchester*, in *Culture in Manchester* (Manchester University Press, 2015), <https://www.manchesterhive.com/view/9781526102089/9781526102089.00012.xml>.

body schema across two VR apparatus (headset and controllers) creating a collaboratively constructed body. Phase 3 extended this by constructing a composite performative body through projected skeletal data from the performer and the audience, via the Kinect. Rather than inserting the audience into the performance through their engagement with VR headsets or explicit audience participation, the decision was taken to utilise the Kinect to track their movements, and project these back into the performance space. The intention was that by projecting real-time audience movement data into the performance space, an indirect dialogue between performer and audience could emerge. This idea links directly to the fracturing of the body through technology that emerged as part of the first research phase and was explored creatively in the second phase. Choreographically, this impulse was foreshadowed by the development of a series of silhouettes, which were projected onto the white backdrop in advance of the streaming of the Kinect data.²⁷⁹ The intent was to establish an aesthetic frame through which the audience might recognise their own silhouettes and discover their agency in engaging in a sort of duet with the performer. In terms of the execution, issues with the Kinect stream into Unreal Engine via TouchDesigner (from which the projection was derived) proved challenging to resolve, and as a result took up a significant period of this phase of development. It exposed how technical dependencies can constrain content development, leading to the development of fallback choreographic strategies. For instance, we developed a choreographic–lighting improvisation structure for when the audience tracking failed. Reflecting on its success in engaging the audience, the outcomes were variable. When the audience realised that they had a direct connection to what was happening in the performance space, their levels of engagement with the technology were high, and resulted in interesting images and movement outcomes. However, some audiences did not recognise their digital selves in the performance and did not engage, forcing the performer to use the fallback strategies, rather than improvise with audience projections. An earlier, explicit intervention is likely to have been a useful way of bringing audience awareness to their capacity to interject and effect the trajectory of the performance. Though the duration of the research period did not allow for this experimentation, a likely first step would be the integration of Kinect data into a pre-show space where audiences are not seated and are given time to have the realisation that their movements and gestures are being recognised and shared

²⁷⁹ See Appendix D

into the space. In effect, to understand their role in co-creating the performance environment.

Further challenges at this phase of the work included the limitation of the lighting rig in the theatre, which firstly took quite some time to set up, and due to technical constraints, produced relatively flat lighting once in place. As previously mentioned, the time taken to prepare and subsequently troubleshoot the various technologies was also a challenge, as there was little access to technical support beyond our own expertise. Despite having conceptualised the work during the first phase with several performing bodies, we returned to a one-hander set up due to financial constraints. Whilst in one way, it was important to me that my body be the object of study, on the flip side it generated a frustration in having to be the performer and the choreographer, a role which ultimately resides in the realm of composition - a critical component of which is the capacity to observe and rearrange. This is perhaps a personal mode of working and should not be generalised, but engaging with scenography, also a visual discipline, on such a deep level and relying on rehearsal footage to assess whether a composition or scene is functioning became deeply challenging.²⁸⁰ Some of this was mitigated through discussion with Robin, who as a collaborator, sat external to the performance and could evaluate how things were perceived. It is also true however that many of my compositional decisions were based on performance instinct rather than compositional instinct. To put this differently, when I felt the relationality of my own body align or sometimes collide with the light and the space, through experience I knew that performatively, something interesting was happening. This contrasts with the moments during the research period in which there was little frisson in the space between my body and its environment, physical or digital. A further challenge, which was not unrelated to a feeling during the first research phase, was the self-inflicted pressure to ensure that the work was of a “show” standard. Whilst the third phase of research was clearly less exploratory and more consolidatory, there was a challenge in remaining open to new findings whilst putting into practice in a performative way some of the outcomes from earlier phases. Again, this required stepping back from the process, and taking stock of the direction of the work, as the days progressed.

²⁸⁰ As I have previously discussed in the introduction to this thesis, film is two-dimensional and often misses things which the human eye does not.

3.4.1 Posthuman Embodiment in Performance

The insertion of technology into the working process clearly disrupts the body-space relationship. A clear example in the first phase of this research is the separation of the headset from its controllers. This dislocated embodiment (through one user wearing the headset and one using the controllers) produced a split agency, where movement in the physical realm triggered a digital response, but without direct alignment between the mover and the viewpoint. The result was an uncoupling of control and perception, where the body no longer operated as a singular unit, but as a composite membrane²⁸¹ between systems. The third phase of this research built on this methodology, engaging a Microsoft Kinect (activated by spectators) to co-create the environment through the projection of movement data into the performance space. This projection was both absorbed by and responded to by the performing body, further highlighting its function as a space of becoming. It is also true that in dancing with the lights and architecture of the space, they become extensions of the body's sensorium. Their purpose is not to frame or enhance the body in a traditionally theatrical way, but to participate in its evolution.

3.5 Findings and Conclusions

Synthesising the practical and theoretical insights across phases, it is clear that the choreography in this work does not operate as a closed system of pre-designed movement. It functions as a relational methodology, structuring attentiveness, responsiveness and co-emergence between the performing body, its environment and the technological systems that are employed. It unfolds through interaction, whether between participants and space as in phase one, or between constructed space, sensory input and technological mediation in phase three. This compositional logic leaves space for a dynamic system in which the body is never neutral; it is always negotiating thresholds, shadows, and constraints. Through these feedback loops its form develops, highlighting its role in navigating the unstable contours of hybrid space. Exposing its fundamental relationship to choros, the choreography in this work maps performance spaces together (physical and digital) through movement, but in doing so acknowledges that the body also is space in the choratic sense. This is particularly evident in the third phase, when movement animates the relationship between the elements of the set, using floorwork to create a pathway between regions; tempo and scale to reveal the potential of less

²⁸¹ Composite here refers to the addition of a prosthesis, either the headset or the hand controllers, which ultimately allows a form to emerge.

constructed spaces; presence and absence to bring attentiveness to the relationality of the whole.

Several distinct findings emerged across the three phases. The separation of the VR headset and controllers across participants revealed a co-constructed body schema. This facilitates an understanding of the hybrid performing body not as a stable, bounded unit, but rather as a technologically mediated construction that can be redistributed across individuals. It reframes the posthuman performing body from a philosophical proposition towards a demonstrable condition of hybrid performance making. The second finding from the making of this work emerged from the Twitch lag experiment in Phase 1 – the delayed video feed in the virtual environment produced an encounter with the past self still in motion. This lends further credibility to the temporal architecture developed in chapter 2, and illustrates a moment where somatic chora became a practice finding. The concept did not precede the encounter, rather, the encounter produced the need for it. Emerging from these practice experiments, the somatic chora describes the hybrid performing body not as a discrete entity, but as a generative realm negotiating between physical and virtual realities. It becomes a space and a condition in which sensory, spatial, social and technological conditions are negotiated and transformed. The body in hybrid performance is both subject and object, present and displaced in time. A third finding concerns the threshold conditions of distributed embodiment. When, in Phase 3, the Kinect audience tracking failed to register perceptually, the audience did not recognise their digital selves and therefore did not engage. It became evident that post-human co-creation requires legibility as a precondition, in that the shared generative space of the somatic chora cannot function if participants cannot locate themselves within it. It reasserts the finding from chapter 2 that onboarding and pre-show structures should be considered within the choreographic remit, rather than simply as a logistical matter. The fourth significant finding emerged as a result of the technological constraints experienced during the making of Phase 3. Taken together, they revealed the encoded assumptions that the technologies carry about what bodies can and should do. These are not neutral; they reflect the epistemologies of their development.

Returning briefly to the three questions that scaffolded the work (What is the in-between or the inter, in this process? How can technology be conceptualised as a performer, and how does it engage with ideas of the in-between? Micro to macro – how can a play on perspectives open new choreographic and scenographic potentialities?), it is

clear the process findings can be mapped directly onto them. The in-between in this process has been conceptualised as a somatic chora, a generative space that arises when the body operates as a membrane across realities. Technology can be conceptualised as a performer in shifting away from understanding it as a prosthesis, and towards a creator through its generation of digital landscapes. When it fails, it becomes an agent of destabilisation of the bodily schema. This research therefore argues not for the management of these disruptions, but for their interrogation, treating failure as an opportunity to tease out the design assumptions of the technology itself. Functionally, it constitutes the somatic chora in tandem with the body, not simply as a vessel for its emergence. Finally, the play on perspectives reveals a dynamic space, enlivened by choreographic and scenographic strategies. These include the transference of spatial configurations between realities, the repositioning of the body as an instrument of seeing rather than being seen (for example in Phase 3 VR projections), and the insertion of audience bodies into the performance space through motion tracking.

The dynamic, responsive approach to performance making employed here generates rich material, but its openness presents challenges in understanding how meaning is constructed and communicated. Just as the body functions as a connector of spaces and space itself, meaning in this work operates at multiple, intersecting levels. For instance, meaning making exists in the embodied encounters of performer and audience; performer and spaces; performer and technologies, alongside its broader cultural context. Nibbelink and Merx's approach to dramaturgy, their relational triad, provides a useful frame through which to explore the interaction of the composition, spectatorial address and context (both social and artistic) in meaning making.²⁸² Their assertion that context is a crucial, yet often overlooked plane in this process aligns strongly with the way in which I have approached this work.²⁸³ I argue in further detail in chapter 4 that for performances engaging cutting edge immersive technology, social and economic contexts are of critical importance to understanding the process of meaning-making.

The third phase of this research, a performative culmination of prior curiosities and experimentation, is perhaps the richest terrain for meaning making within this triadic framework. Compositionally, the work's movement through time is choreographically

²⁸² Liesbeth Groot Nibbelink and Sigrid Merx, 'Dramaturgical Analysis: A Relational Approach', *FORUM+* 28, no. 3 (2021): 4–16, <https://doi.org/https://doi.org/10.5117/forum2021.3.002.groo>.

²⁸³ *Ibid.*

realised as moving from first position at the opening of the work to a postmodern focus on pedestrian, everyday movement at its close. It is this journey through time and space that propels the work forward, underpinned by shifts in the spatial-temporal aesthetics. Lights change in colour, intensity, and direction; spaces open and close in response to and responding to the presence or absence of the body. These shifts function as structural markers, revealing the organising principle of the work. Its fragmentary, episodic structure creates dramaturgical progression through environmental transformation rather than narrative development. For the audience, the gradual scenographic evolution is marked in the journey from theatrical lighting to naturalistic illumination, i.e. from a classical single spotlight at the beginning to the warmth of a domestic lamp, echoes the choreographic journey from classical positioning to everyday movement, or from formality to familiarity. This helps to create a felt sense of temporal progression that audiences can read as dramatic development even without a conventional plot structure, and guides attention and affective response. Tension arises too from the interplay of movement and technological response. For instance, the exposure of the performer's internal world through the projection of the virtual space they are inhabiting through the VR headset onto the physical performance space generates questions regarding the nature of reality, privacy, and positionality within the performance space. This generates meaning through the quality of these layered, sensory interactions rather than any narrative causality.

The final strand of Nibbelink and Merx's triad refers to the artistic and social context within which the work was generated, and its contribution to the broader sense-making project that occurs throughout. In this work, the technology is not only a tool but brings its own agency into the space. As I argue in chapter 4, the influence of the politics of immersive technologies should not be dispensed with as irrelevant; rather, they condition the work either by imposing limitations or simply by exposing the assumptions embedded in their development.²⁸⁴ This phase of research engages virtual reality technologies including VR headsets and motion tracking systems, and both of these attempt to discipline the body in various ways. For example, the design of the headset

²⁸⁴ For example, through the types of data processing they perform or the underlying assumptions regarding how data is expressed. Normative frameworks (in the humanist sense, i.e. male) of "universal" technologies are exposed through things such as poorly fitting motion capture suits, or through gender-based differences in the experience of cybersickness in virtual environments. Kay Stanney et al., 'Virtual Reality Is Sexist: But It Does Not Have to Be', *Frontiers in Robotics and AI* 7 (January 2020), <https://doi.org/10.3389/frobt.2020.00004>.

limits the movement options available to the performer as certain trajectories (e.g. inversions or extended floorwork involving rolls or other dynamic motions) become extremely difficult, if not impossible, due to its weight. As previously discussed, it lacks a defined origin point in the physical space which further disorients the performer as the virtual becomes untethered from the physical. The motion tracking technology used, the Microsoft Kinect Azure, privileges limb-based gestures, underscoring a limited understanding of embodied physicality in its interaction design. These findings reinforce Strahler Holzapfel's assertion in that they "...reveal how bodies are both bound and conditioned by spatial and cultural practices".²⁸⁵ Rather than compromising on these impositions, the choreographic logic of the work allows the body and performance space to become a site of resistance; these constraints are acknowledged, subverted and made visible. This friction generates a new movement vocabulary and reveals the co-constructed meaning of the work through the composition of human, objects, and machines. It proposes a view of the world that understands and prioritises a non-hierarchical interdependence, recognising the human body as a porous membrane that functions as chora, a site of transformation and resistance. In doing so, the work seeks to "expand from the temporal and spatial boundaries of its own stage",²⁸⁶ bringing its audiences to places they did not know existed.

3.6 From Choreographic Bodies to Data Ethics

The somatic chora framework proposed in this chapter theorises how performing bodies operate as a generative, transformative membrane between physical and digital realities. Yet these hybrid performance conditions are shaped by political and ethical contexts. Chapter 4 shifts towards an exploration of ownership, consent, new labour conditions, and the power structures embedded in these techno-choreographic performance works.

²⁸⁵ Strahler Holzapfel, 'From Landscape to Climatescape in Contemporary Dance-Theater', 423.

²⁸⁶ Ibid, 423.

Chapter 4. Dance Data, the Performing Body and Ethics

4.1 Introduction

The Front is a live solo dance performance that uses live motion capture to develop a scenography from the choreographic score. It was performed in the round at Dublin Theatre Festival in October 2023 by Yves Lorrhan, and was developed in collaboration with director Jo Mangan, dramaturg Liz Fischer and creative technologist Guillaume Auvrey. Through an articulation of the choreographic framework and its subsequent technological mediation in live performance, this chapter seeks to reconsider the pathways of dance data, from studio to stage. It used the Perception Neuron motion capture system, which, as I have explored in chapter 2, is an inertial system, facilitating a wireless transmission of data from dancer to visualisation software. This journey, from embodied improvisation through corporate systems to live visualisation, grounds the analysis.

Creatively, *The Front* integrates emerging technologies in live performance, sharing a genealogy with artists including Merce Cunningham, Trisha Brown, Troika Ranch, Bianca Li, Motion Bank, Adrien M & Claire B, Gibson/Martelli and Gilles Jobin to name just a few. More specifically, a project entitled *Hacking the Body 2.0* by artists and academics Camille Baker and Kate Sicchio explored the role of sensors and structured improvisation in live performance as a means of performatively investigating data as identity and ethics of data ownership.²⁸⁷ *The Front* draws on some of the learnings articulated by Baker and Sicchio, and seeks to extend them through the proposal of an ethical framework for embodied data practices in live performance. As artists continue to adopt and engage with these technologies in their practices, it is crucial that they do so with an understanding of how their work may be reappropriated by big data sets for purposes such as, say training algorithms for target detection in military, policing or

²⁸⁷ Camille Baker and Kate Sicchio, 'Hacking the Body 2.0: Dancing between Commercial and DIY Wearable Technology', *International Journal of Performance Arts and Digital Media* 14, no. 1 (2018): 107–20, <https://doi.org/10.1080/14794713.2018.1446360>.

surveillance contexts,²⁸⁸ or how motion data, as biometric data, can in fact be personally identifiable.²⁸⁹

Though many models for an ethics of care²⁹⁰ exist in, say, collaborative art practices,²⁹¹ digital practices in galleries and museums²⁹² or contingent labour in the creative industries²⁹³ to name just a few, there is currently only one model that addresses ethical concerns as they relate to immersive artistic performance. Through an extensive scoping review of sources relating to immersive biometric performance in HCI, Performing Arts and Social Sciences over the last 30 years, Sparrow et al. propose a framework of ethical considerations for artists and researchers in this space.²⁹⁴ Additionally, in 2023, SAG-AFTRA, the American labour union that represents television and radio artists, secured consent, copyright and financial protections for its members during the creation and use of digital replicas of performers, though these terms are largely geared towards actors working in the games industry and do not include provisions for live performance work.²⁹⁵ British union Equity has also negotiated pay rates and agreements for its members, but this too is categorised in the “videogames, voiceover and MoCap” category of its website.²⁹⁶ Given this gap, the framework proposed in this chapter was developed through an engagement with its artistic, social and political context. It required, as de la Bellacasa describes, “thinking in the world...acknowledging our own involvement in perpetuating dominant values rather than

²⁸⁸ Haitao Wang et al., ‘Deep Learning Based Target Detection Algorithm for Motion Capture Applications’, *Journal of Physics: Conference Series* 1682, no. 1 (2020): 012032, <https://doi.org/10.1088/1742-6596/1682/1/012032>.

²⁸⁹ Mark Roman Miller et al., ‘Personal Identifiability of User Tracking Data during Observation of 360-Degree VR Video’, *Scientific Reports* 10, no. 1 (2020): 17404, <https://doi.org/10.1038/s41598-020-74486-y>.

²⁹⁰ I have chosen not to term the framework I have developed an ethics of care, as this is a substantial philosophical framework, whose traditions and concerns cannot be adequately engaged within the confines of this chapter.

²⁹¹ Danielle Ayelet Aldouby-Efrain, ‘Ethics of Care in Collaborative Art Practices’ (Doctor of Education, Columbia University, 2024), <https://doi.org/10.17077/2326-7070.33856>.

²⁹² Hannah Lewi et al., eds, *The Routledge International Handbook of New Digital Practices in Galleries, Libraries, Archives, Museums and Heritage Sites* (Routledge, 2019), <https://doi.org/10.4324/9780429506765>.

²⁹³ Ana Alacovska and Joëlle Bissonnette, ‘Care-Ful Work: An Ethics of Care Approach to Contingent Labour in the Creative Industries’, *Journal of Business Ethics* 169, no. 1 (2021): 135–51, <https://doi.org/10.1007/s10551-019-04316-3>.

²⁹⁴ Sparrow et al., ‘Heart and Soul’.

²⁹⁵ SAG-AFTRA, ‘Tiered-Budget Independent Interactive Media Agreement’, SAG-AFTRA, 2024, https://www.sagaftra.org/sites/default/files/2024%20Tiered-Budget%20Independent%20Interactive%20Media%20Agreement_1.pdf.

²⁹⁶ . I have contacted Equity regarding further details on this agreement but have had no response.

retreating to the sheltered position of an enlightened outsider who knows better”.²⁹⁷ In other words, through reflection on my approach to care for the performer, and to a lesser degree, audiences, during the development and performance of *The Front*, five key principles for ethical practice with embodied data in live performance have emerged. These are conceptualised as follows: considering the structures of technology; data practices; power dynamics; relational consent and critical practice integration.²⁹⁸ Their formulation builds on learnings across all four practice works and key questions for practitioners are developed to support their integration into practice.

4.2 Studio Development

4.2.1 Choreographic and Reflective Frame

To begin a discussion on the in-studio, choreographic development of *The Front*, it is helpful to engage briefly with precisely *how* development happens, or with the distinct stages of a dance-making creative process. Historically, research and writing on the description of choreograph processes and/or analysis thereof has been scarce,²⁹⁹ though this aligns closely with the larger issue of documentation in dance. Though an increasing number of scholarly discussions focus on choreographic processes or elements thereof,³⁰⁰ including choreographic thinking tools,³⁰¹ choreographic contributions from professional dancer during the creative process³⁰² or creative decision making,³⁰³ few have proposed a

²⁹⁷ María Puig de La Bellacasa, *Matters of Care: Speculative Ethics in More than Human Worlds*, Posthumanities 41 (University of Minnesota press, 2017), 10.

²⁹⁸ A full expansion of these principles is available in section 3.4.1 of this chapter.

²⁹⁹ Jo Butterworth, ‘Teaching Choreography in Higher Education: A Process Continuum Model’, *Research in Dance Education* 5, no. 1 (2004): 45–67, <https://doi.org/10.1080/1464789042000190870>.

³⁰⁰ see for example Maya Gavish and Catherine J. Stevens, ‘Thinking Strategically about Dance Making: An Analysis of the Structuring Stage and the Strategies Choreographers Use for Varying Dance Works’, *Dance Research* 38, no. 1 (2020): 41–64, <https://doi.org/10.3366/drs.2020.0290>; Na-ye Kim, ‘Identifying Choreographic Knowledge: Choreographic Techne and Phronesis’, *Research in Dance Education* 17, no. 1 (2016): 42–59, <https://doi.org/10.1080/14647893.2015.1135896>; Linda Ashley, ‘Shape Shifting: Choreographic Process as Research’, *Conference Proceedings* (Auckland, NZ), 2005, 13.

³⁰¹ deLahunta et al., ‘A Conversation about Choreographic Thinking Tools’.

³⁰² Jenny Roche, ‘Dancing Strategies and Moving Identities: The Contributions Independent Contemporary Dancers Make to the Choreographic Process’, in *Contemporary Choreography*, 2nd edn (Routledge, 2017); Rachel Farrer, ‘The Creative Dancer’, *Research in Dance Education* 15, no. 1 (2014): 95–104, <https://doi.org/10.1080/14647893.2013.786035>.

³⁰³ Ana R. Fonseca et al., ‘Decision-Making In A Choreographic Creative Process: A Quantitative Approach’, *The Journal of Creative Behavior* 55, no. 2 (2021): 433–46, <https://doi.org/10.1002/jocb.464>; Catherine Stevens et al., ‘Choreographic Cognition: The Time-Course and Phenomenology of Creating a Dance’, *Pragmatics & Cognition* 11, no. 2 (2003): 297–326, <https://doi.org/10.1075/pc.11.2.06ste>.

more cohesive framework than Butterworth.³⁰⁴ This model proposes an eight stage process, though it acknowledges the sometimes non-linear, cyclical nature of such.³⁰⁵

Stage 1: Stimulus/Conception/Intention; Stage 2: Dance Content; Stage 3: Process; Stage 4: Dance Content Development; Stage 5: Structuring; Stage 6: Completion/Rehearsal; Stage 7: Performance/s; Stage 8: Evaluation/Reflection.

This chapter will borrow Butterworth's framework as an organising principle, allowing each individual phase to reveal its construction and insights, though some stages will naturally carry more weight than others.

4.2.2 Stimulus/Conception/Intention

Conceived first in-studio in collaboration with the dancer, *The Front* began with a provocation from director Jo Mangan: what creative potentials and challenges could a non-narrative, live motion capture (MoCap) dance work present? Taking this as a conceptual frame, I began with a consideration of space. What do the unique propositions of this technology allow for or constrain when considering the architectural relationship between space and body? Similarly, the decision to use live MoCap, which generates live visuals to create its own scenography implicated an aesthetic consideration that is unique to this type of intermedial work. It could be argued however that this facet of choreographic concern is a mere extension or reconfiguration of dance aesthetics; as Sparshott notes, it first appeared in philosophical literature in Plato's *Laws*, where "it figured as an educational device – a way in which public dance festivals are to celebrate and enhance civic order".³⁰⁶ Finally, how might the affordances of the technology engage the audience in a way that extends the dramaturgy, or enlivens the performance?

4.2.3 Dance Content and Process: Improvisation as choreographic methodology; improvisation as phenomenology

In drawing these curiosities together, I began by experimenting with task-based improvisation without musical prompts or the imposition of any wearable technology. Improvisation, as a choreographic tool, facilitates the emergence of a dancer's unique movement repertoire and embodied knowledge. The intersection of improvisation and data ethics may at first seem unclear; however, in understanding improvisation as

³⁰⁴ Butterworth, *Dance Studies*.

³⁰⁵ Ibid.

³⁰⁶ Francis Sparshott, 'The Future of Dance Aesthetics', *The Journal of Aesthetics and Art Criticism* 51, no. 2 (1993): 227, <https://doi.org/10.2307/431389>.

phenomenology, it establishes that the movement patterns are not neutral 'movement data' but deeply personal, culturally situated knowledge that deserves ethical protection.

In the process of creating and/or choosing movements in the moment, it attempts to disrupt the embedded movement patterns using the body as a thinking tool, rather than as an instrument of memory, repetition or execution.³⁰⁷ This is not to suggest that improvisation is a remedy to the Cartesian mind/body dualism that often presupposes the act of thinking; rather, it assumes that bodily articulation is in itself an act of thinking. My contention here is simply that improvisation facilitates transcending the facets of conscious thinking that fuel the expression of habitual movement. In cognitive science terms, this may be understood as divergent thinking, which is predominantly driven by abstract connection-making capacities in the right hemisphere of the brain.³⁰⁸ This appears to enable dancers to integrate risk-taking, playfulness and metaphorical thinking with left hemisphere driven self-evaluation, leading to globally synchronised brain activity providing new insights and possibilities.³⁰⁹ The precise contextual mechanisms through which this can occur however is a hotly debated topic; for some, spontaneity resides at the core of movement improvisation, whilst for others, the distinctions in the enactment of a dancer's agency in improvised and non-improvised dances holds the key.³¹⁰ The scope of this chapter precludes an in-depth analysis of these arguments, though it is useful to say that interdisciplinary research into movement improvisation is still in its infancy, and there is not yet a clear consensus on its workings.³¹¹

For Susan Leigh Foster, improvisation requires the dancer to tack “back and forth between the known and the unknown, between the familiar/reliable and the

³⁰⁷ DeSpain, 2014

³⁰⁸ Katia Savrami, 'A Duet between Science and Art: Neural Correlates of Dance Improvisation', *Research in Dance Education* 18, no. 3 (2017): 273–90, <https://doi.org/10.1080/14647893.2017.1369509>.

³⁰⁹ Ibid.

³¹⁰ De Spain, 2014.

³¹¹ The discussion regarding the mechanisms of improvisation has been ongoing since at least the 1960s, but it has picked up significant momentum since the 1990s both within dance studies, and in other domains. It spans a diverse array of practices and is commonly used as a choreographic method in the development of contemporary dance works, which has shifted the balance of authorial power in dance making, leading to a rise in co-created works. See Kent De Spain, *Landscape of the Now: A Topography of Movement Improvisation* (Oxford University Press, 2014) or Ann Cooper Albright and David Gere, *Taken by Surprise: A Dance Improvisation Reader* (Wesleyan University Press, 2003). for a lineage and variety of approaches to movement improvisation.

unanticipated/unpredictable”.³¹² This sense of the unknowability of improvisation appears again in De Spain’s volume on movement improvisation.³¹³ Throughout, his interviewees sometimes struggle to describe what is happening to them as they engage in the process, or to find commonalities between their experiences. For Middelow however, “...improvisation can be understood as grounded in shared practices of the body that are carried out through common understandings within a given community”.³¹⁴ On its face, this seems to undermine previous assertions regarding the unknowable nature of improvisation, but on closer inspection is full of the same vagueness and ambiguity that permeates earlier discussions. For instance, “shared practices of the body” or “common understandings” both rely on such things as language, culture and physical ability or disability to establish common ground. Similarly, the idea of “community” is nebulous – does this refer to the dance community as a whole or various sub-communities? What are the conditions under which membership to these “communities” is obtained? Though none of these questions are to the fore in this work, they do lend themselves to a rethinking of how one might understand what is produced by this mode of working, a task which is very much under question in this process. Perhaps dance improvisation as a device and an output becomes less unknowable when it is exorcised from the realm of dancing. In understanding improvisation not only as a tool, but as a sort of grammar, it becomes possible to parse what is being articulated formally, spatially, and emotionally. It becomes, in a way, doing a phenomenology.³¹⁵ As De Spain notes, “improvisation...can provide a forum for thoughts and desires from the multiplicity that is the self, either in separation or in a controlled cacophony.”³¹⁶

³¹² Foster in Albright and Gere, *Taken by Surprise*, 3. Foster’s understanding of the *known* includes the performance context, any choreographic rules (including the performance score) that delimit the improvising body’s choices, and any predispositions of the individual body towards a specific movement vocabulary made habitual through training in a specific dance tradition. It also includes any allied medium with which the performance is in collaboration, understood in this case to include motion capture. Finally, it includes anything which has already emerged in the performance of improvisation. By contrast, the unknown is “that which was previously unimaginable, that which we could not have thought of doing next”. Ibid, 4.

³¹³ De Spain, *Landscape of the Now: A Topography of Movement Improvisation*.

³¹⁴ Vida L. Middelow, ‘Improvisation as Paradigm for Phenomenologies’, in *Back to the Dance Itself: Phenomenologies of the Body in Performance*, ed. Sondra Fraleigh (Urbana: University of Illinois Press, 2018), 64.

³¹⁵ It is important to note the contributions of both Maxine Sheets Johnson and Sandra Horton Fraleigh to discussions of phenomenology in dance studies. Though neither of them explicitly refers to improvisation as phenomenology (or vice versa), their work has been extended by Vida Middelow, who I reference here, to encompass this intersection.

³¹⁶ De Spain, *Landscape of the Now: A Topography of Movement Improvisation*, 54.

Analysing improvisation through the lens of phenomenology at first appears an unwieldy task. An idiosyncratic method, read through a framework which prioritises individual experience seems like an impossibility. And yet, through the creation of *The Front*, it is my experience that reading both the choreographic process and outcomes in this way has proved insightful. In doing so, it is inevitable that some data from the process remains unaccounted for, though I attempt to include some, if not all of this through other channels. Both improvisation and phenomenology require a centring of the self as a starting point for an exploration of the world, whether through movement or otherwise. For Merleau-Ponty,

..since the genesis of the objective body is only a moment in the constitution of the object, the body, by withdrawing from the objective world, will carry with it the intentional threads linking it to its surrounding and finally reveal to us the perceiving subject as the perceived world.³¹⁷

In other words, Merleau-Ponty is suggesting that the body, as both subject and object, anchors us in space and time, creating the conditions for meaning and intentionality. It is the reciprocal nature of a body seeing and being seen; of its inherent connection to its environment and the emergence of information therefrom that is of interest in relation to dance improvisation.³¹⁸ To further this line of thinking, anthropologist Thomas Csordas notes that “embodiment begins from the methodological postulate that the body is not an object to be studied in relation to culture, but it is considered as the subject of culture, or in other words as the existential ground of culture”.³¹⁹

If a dancing body working within the structures of improvisation (as they have been set either by the self or by the choreographer) is in fact replicating, or interpreting the systems of their training, culture, physical (dis)ability or any other social or cultural condition from which their experience has emerged, then it follows to suggest that the material resulting from this process is personal. It renders visible the unseen, analogous, for example, to the work of psychoanalysis. Or, according to Spinoza, “what the body can

³¹⁷ Maurice Merleau-Ponty, *Phenomenology of Perception: An Introduction*, Repr, trans. Colin Smith, Routledge Classics (Routledge, 2006), 83.

³¹⁸ Though the language of “seeing” suggests a sensory hierarchy, it is unreasonable within the context of dance to assume that hierarchy. Much of the work of dancers and choreographers relies on what is perceived through other senses, most particularly hearing, touch and kinaesthesia.

³¹⁹ Middelow, ‘Improvisation as Paradigm for Phenomenologies’, 60.

do, that is its soul”.³²⁰ Similarly, in his preface to Franco Berardi’s book, *The Soul at Work*, Jason Smith argues that not only is the soul the glue that binds the collective, but that “it is an aesthetic organ as well, the exposure of thought to the contractions and dilations of space, to the quickening and lapsing of time”.³²¹ In her reimagining of the “phenomenologist as an embodied improviser”,³²² Middelow points towards letting go (perhaps of movement patterns or structures); vulnerability (a capacity for risk taking, emotionally or otherwise); openness to experience; and autonomy as critical elements on the trajectory “towards a sense of (transitory) essence”.³²³ Looking closely, these conditions broadly align with the cognitive science approach outlined earlier, but there is also a resonance with the foundations of psychodynamic thought.³²⁴

In practice, the use of task of improvisation in the studio during the development of *The Front*, began by constructing a geometric representation of the studio space on paper and setting the conditions of the movement qualities, or effort (see Figure 23).³²⁵ The studio space, a standard square with windows on two sides and mirrors on one, was demarcated through the numbering of its corners (1-4) and the creation of diagonal pathways. We began by simply engaging pedestrian movement along these trajectories; walking, running, and changing direction. I began layering efforts and shapes and attending to isolated body and spatial dynamics. For instance, we generated a spiral on the diagonal through the neck and torso, alternating between sudden and sustained efforts. Through framing the process in Laban terms, it is critical to note my own positionality. I was creating work in a European context, having received a largely Eurocentric dance education. I was working with a dancer of a different heritage, a Brazilian dancer, whose own training has been rooted in strong social dance tradition (which has historically eluded strict codification), extending from samba to capoeira via contemporary dance. Clearly, by engaging Laban’s terms in my task-based instructions, a specific

³²⁰ Spinoza in Franco ‘Bifo’ Berardi, *The Soul at Work. From Alienation to Autonomy*, trans. Francesca Cadel and Giuseppina Mecchia, with Jason Smith (Semiotext(e), 2009), 21.

³²¹ Smith in Franco ‘Bifo’ Berardi, *The Soul at Work. From Alienation to Autonomy*, trans. Francesca Cadel and Giuseppina Mecchia, with Jason Smith (Semiotext(e), 2009), 9

³²² Middelow, ‘Improvisation as Paradigm for Phenomenologies’, 75.

³²³ Ibid, 75.

³²⁴ This is perhaps unavoidable, given the contemporaneous development of psychoanalysis and phenomenology, and their integration by practitioners and theorists including Merleau-Ponty, Lacan and Sartre.

³²⁵ It should be noted that improvisation is not a practice that is confined to the studio – in fact, it has been applied to an act as commonplace as the navigation of a crowded footpath (DeSpain, 2014).

choreographic logic was being imposed onto his movement. As Imus et al. outline in their critical analysis of Laban's history and subsequent work:

Can any single movement observation/assessment/analysis system, however flexible, be applied equitably to the vast diversity of human movements and the many different cultural, aesthetic, and moral values that are embodied? More particularly, what does any system include and omit?³²⁶

As I continued to set series of tasks, Yves responded with improvised flows. His movement language challenged my own; certain rhythmic patterns and weight transfers that came naturally to him were entirely alien to my own internalised movement schema. For instance, one improvisatory task asked: create a cross shape with your whole body in eight counts, incorporating moments of free and bound flow, and with strong and light weight. Yves' natural centre of gravity remained low throughout, knees bent and head alert. This revealed his capoeira training, in which "the demand to watch the other player in capoeira, instead of giving in to the inclination to look down, forces practitioners to develop a distinctive sensory system... a peculiar deep neurological enculturation of equilibrium".³²⁷ The enculturation of equilibrium that Downey is referring to here is the cultural influence on the unconscious training of the perceptual, proprioceptive and motor processes that underpin our day-to-day function. In other words, the ways in which behaviour patterns, training techniques and subtle cultural kinaesthetic norms were expressed in this improvisation reveals, in Csorda's framing, an expression of Yves' cultural and social context, lending his output its highly personal status.³²⁸ So, if task-based improvisation within structured choreographic contexts can surface culturally specific movement patterns that carry personal significance, then it seems reasonable to suggest that these outputs should be handled with care.

³²⁶ Susan D. Imus et al., 'More Than One Story, More Than One Man: Laban Movement Analysis Re-Examined', *American Journal of Dance Therapy* (New York, New York) 44, no. 2 (2022): 181, <https://doi.org/10.1007/s10465-022-09370-5>.

³²⁷ Daniel H. Lende and Greg Downey, *The Encultured Brain: An Introduction to Neuroanthropology* (MIT Press, 2012), 169.

³²⁸ It should be acknowledged that the embodied traditions that are being expressed here through these equilibriums are rooted in historical racial struggle. The origins of capoeira lie with African slaves in Brazil, for whom it was a means of preserving their heritage. Though it gained popularity with Europeans who moved to Brazil after its independence from Portugal in 1822, continued oppression against Afro-Brazilians led to it being outlawed from 1892 until 1934. In 1937, it was recognised as a national sport. Tamara Dunn, 'Capoeira | Sports and Leisure | Research Starters', EBSCO, 2023, <https://www.ebsco.com>; Barbara Browning, *Samba: Resistance in Motion*, Arts and Politics of the Everyday (Indiana Univ. Press, 1995).

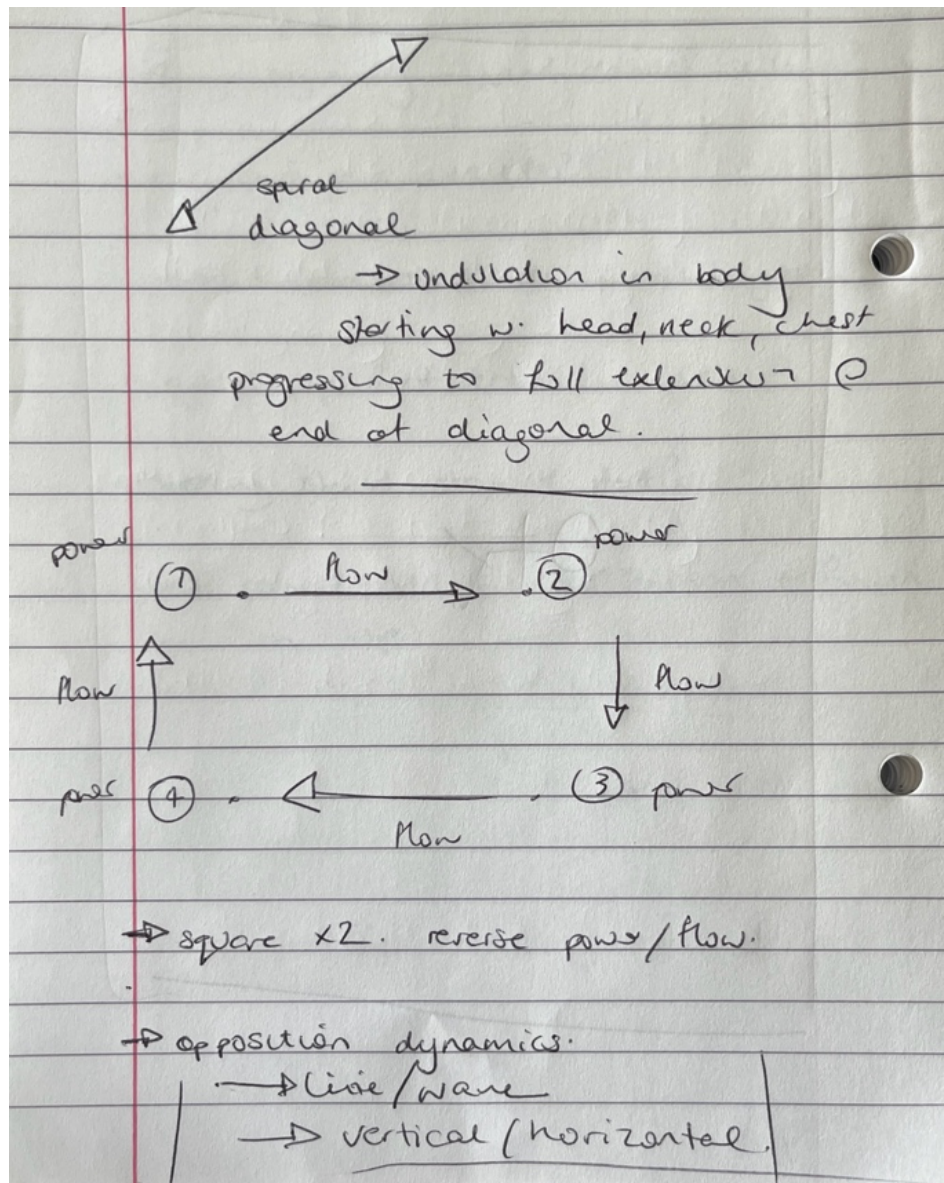


Figure 23: Setting the initial conditions of improvisation.

4.2.4 Dance Content Development, Process and Structuring

After a series of short improvisational experiments from which a particular aesthetic and affective sensibility emerged, I began the process of composition.³²⁹ Choosing several of the movement phrases that had been generated via the task-based improvisation, we began to refine and reshape them.³³⁰ During the development of *The Front*, my role as

³²⁹ These included tasks such as creating a spiral phrase only with the head, torso or limbs; engaging a specific space (e.g. a corner of the studio, or a 1x1m square on the floor) with movement effort, scale or rhythm; working from pedestrian movement including walking, running, stopping and changing direction.

³³⁰ See rehearsal footage in Appendix C

choreographer put me outside of the act of improvisation. My role was ultimately in guiding its transition from an act of pure experimentation and exploration into rigorous, structured creation. Though we had been working in purely analogue terms for the first several rehearsals, I began to consider how the use of MoCap (both in terms of the physical limitations imposed by the suit, and how this capture data might be expressed visually) would impact on the execution of the movement phrases I chose to keep. Drawing on both my previous experience with MoCap and on inspiration from the architecture of the studio space, I began to set the curvature of the body against its harsh geometric lines (see Figure 24). I chose oppositional movement dynamics confined by clear spatial constraints to order the improvisational material. The architecture of the body became both a counterpoint to, and mirror of the architecture of the space. In a way, this aesthetic choice mirrored the integration of our two practices and contexts; my geometric, structured movements language as a foil for Yves' softer, rounder, bouncier vocabulary. To understand this in the terms of Merleau-Ponty might be to understand this stage of the process as setting to conditions for meaning-making within the work.

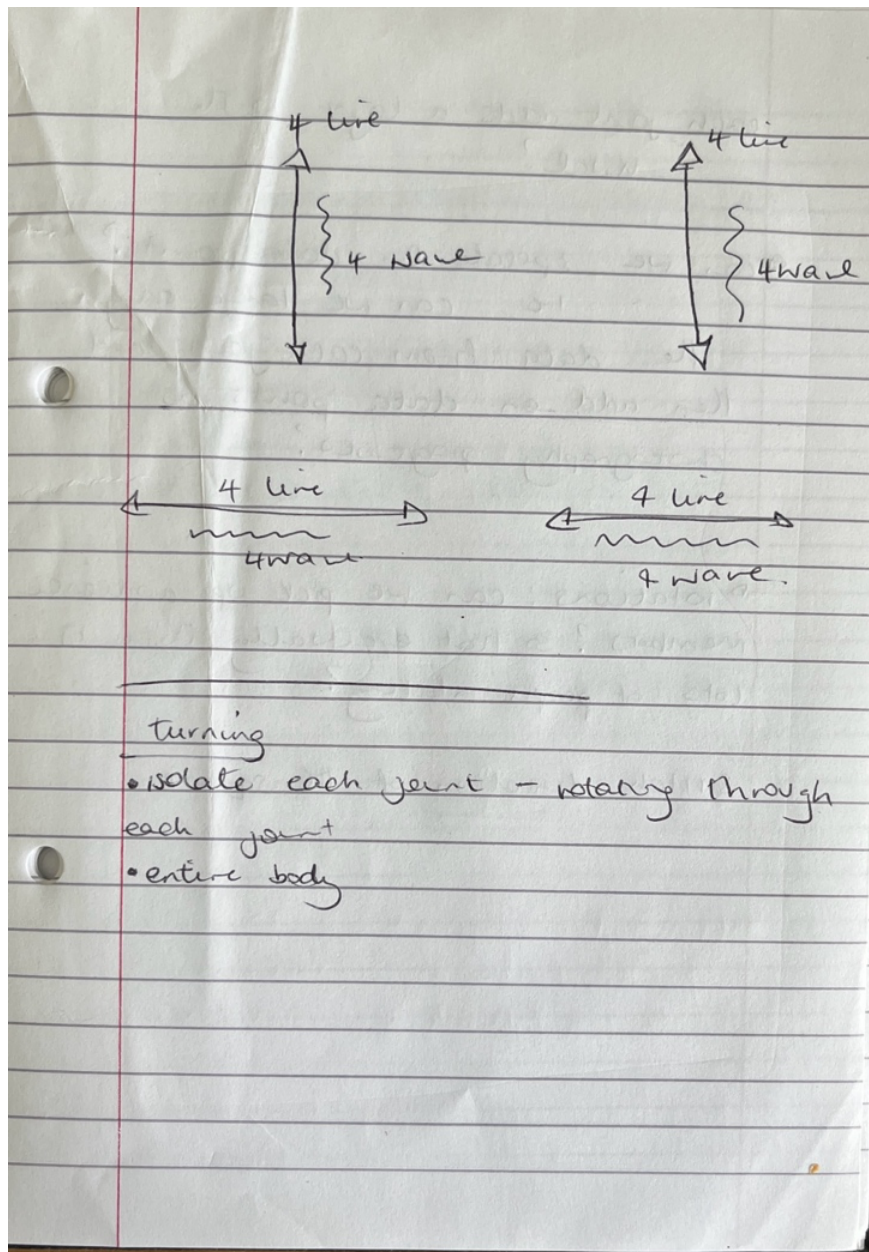


Figure 24: Choreographic Ordering

Early in the process, resulting from previous experiments, I was conscious of the technical imposition of a motion capture suit on the physicality of a dancer, alongside the aesthetics of the technology.³³¹ I began by testing a prototype AI mocap system called MoveAI. In effect, this video-to-3D motion capture system uses computer vision, applied AI, biomechanics and physics to extract natural human motion from video. The set-up is markerless (meaning the body is not constrained by either optical markers or an inertial mocap suit) and relies only on iPhone technology. The potential of this technology lay in

³³¹ See chapter 2 for an analysis.

its shift away from the aesthetics of technology that are so often associated with this type of work, and a potentially efficient way to prototype choreography.³³² With the help of a computer science colleague, Donal Egan, we set up the studio with three iPhone cameras in a triangular configuration to capture as much of the studio volume as possible. We began the capture session with several short phrases – a jump, a floor roll and a turning sequence. This series of phrases was chosen because I knew that they are some of the most challenging to record effectively for motion capture systems. Whilst initial data looked promising (the accuracy of the capture was high, the set up was straight forward and the technical requirement were low), the processing speed of the data was unbearably slow. It first required an upload to the cloud, followed by processing, after which we could download and see the full results of the session.³³³ This ruled out the usability of MoveAI in live performance as well as in rehearsals, as the processing took several hours. Returning to the Perception Neuron (PN) suit, a system which I had used in earlier work, was a decision taken by the director and I as its integration with software including Touch Designer and Unreal Engine became paramount. Perception Neuron is an inertial system, meaning that the data is transferred wirelessly to a computer, where it can be viewed and rendered through a game engine or other software. It is highly portable, though its functionality is determined by the strength of the electromagnetic field in which it is operating.

As we continued through the process of movement development in the work, it became clear that there were three distinct logics at play in the studio: my choreographic logic and Yves' bodily logic, both of which were exposed through our timing structures, amongst others, and the technological logic of the PN system. Though as I have already argued in chapter 2, whilst choreography can operate as a form of technology, there are still significant points at which the logics in the studio came into conflict. This tension quite often led to moments of creative “stuckness”, where I could not articulate or solve an aesthetic or rhythmic challenge. For instance, samba has a different rhythmic flow than ballet, and an incorrect assumption on my behalf that Yves and I were both working on the same temporal structure led to several hours of troubleshooting in attempting to make

³³² Prototyping choreography here refers to testing the choreography and the visuals simultaneously, as they inform each other's development. For instance, a movement phrase may read well in the studio, but the way in which that data is transposed into a visual may render it entirely redundant. For more on the precise mechanisms of this interoperability, see chapter 2.

³³³ See testing MoveAI video in Appendix C

the section flow effectively. Samba, as Browning reports, operates as a form that “...narrates a history of cultural contact between Africans, Europeans, and indigenous Brazilians. This story, however, is not acted out mimetically but compressed in a single musical phrase”.³³⁴ Samba weaves polymetric rhythms across a 2/4 frame, suspending the strong beat and accentuating the weak. By contrast, the type of classical music that is used to train ballet dancers (usually) prioritises a strong downbeat, metric clarity and predictable phrasing.³³⁵ De Spain proposes a process driven approach for solving this type of creative conundrum: “Move. Change it, layer it, play with it. Move again”.³³⁶ In other words, through iterative testing and systematically ruling out choreographic elements, a solution will eventually present itself. When the issue of timing came to the fore, the solution seemed to be to impose a strict eight-count rhythmic structure onto the movement. The effect of this was twofold: firstly, this was entirely counter-intuitive for Yves, who’s internal rhythmic schema was structured entirely differently. He had to actively push against his cultural context to operate within the timing framework that I asked of him. It took significant effort for both of us to work through this fundamental difference. Secondly, I became aware of a sense of re-imposition of a colonial structure, and this became a point of ethical dilemma for me.³³⁷ When this was rehearsed with the PN suit, it was evident that it too carried its own temporal framework, through its rendering cycles, refresh rate, network time and experiential time.³³⁸ The reconciliation of these logics was deeply challenging but rendered the conditions of the work meaningful.³³⁹

As I have previously mentioned, in attending to this diverse stylistic and linguistic space, the choreographic strategies I employed attempted to both leave space for individual movement qualities, embodied histories and spatial relations, whilst simultaneously creating a work that could engage the questions that drove the process. In facilitating the autonomy of the dancer in this way, our working relationship broadly

³³⁴ Browning, *Samba*, xxiii.

³³⁵ There are of course exceptions to this – see for example Jonathan Still, ‘The Politics of Musical Time in the Everyday Life of Ballet Dancers’, in *The Oxford Handbook of Time in Music*, ed. Mark Doffman et al., Oxford Handbooks (Oxford University Press, 2022). for an analysis of metrical anomalies in musical works by Tchaikovsky, Bizet and Verdi that are used in children’s ballet classes.

³³⁶ De Spain, *Landscape of the Now: A Topography of Movement Improvisation*, 44.

³³⁷ Though this is not the focus of the ethical framework that I propose later, it was a moment that awakened my own ethical awareness in the studio.

³³⁸ See chapter 2 for a full description.

³³⁹ I return to the idea of the decolonisation of time in more depth in chapter 5.

aligned with process three of Butterworth's didactic-democratic spectrum model.³⁴⁰ Here, the choreographer operates as pilot and the dancer as contributor, the balance of creative power in the studio more evenly distributed than in a traditional, didactic process.

4.2.5 Rehearsal and Performance: Audience, Technology, Relationality

The construction of relationality between audience-performer-environment in *The Front* was developed early in the creative process through reflections in the studio on social dance traditions in Brazil, and their resonances with legacy of Ireland's social dance history. Both occupy a pluralistic cultural space, engaging the diversity of embodied memory in post-colonial societies. For instance, both Irish set dancing and Brazilian June quadrilles originated as European salon dances (primarily the quadrille, which stemmed from the French cotillon), introduced by colonial powers which eventually trickled down from the landowning classes to the lower classes, and evolved to reflect the social histories thereof.³⁴¹³⁴²³⁴³ As the movement language in the work developed, it became evident that a tension lay between the embodied knowledge and interconnectedness of social dance, and the impositions of the wearable technology. In social dances, meaning is generated through both a shared embodied cultural knowledge or framework, and through understanding the body as a site of relationality. There is "a quality to bodies that we feel, and in that feeling, a kinaesthetic as much as an emotional response is central. Bodies attract, repel and move other bodies".³⁴⁴ In other words, alongside a shared contextual understanding, the sensation of the embodied presence of another is central to the capacity of a dance work to generate meaning.³⁴⁵ This relationality to the other in space was borne out through placing the live audience in the round; the potential for the audience to feel the air on their skin as the dancer moved through it, to hear the sound of his breath, or to see the sweat on his skin became a way of immersing them in the

³⁴⁰ Butterworth, 'Too Many Cooks? A Framework for Dance Making and Devising'.

³⁴¹ 'A Short History of Irish Céilí Dancing – Cairde Rince Céilí Na hÉireann', accessed 18 May 2026, <https://ceilidancing.com/a-short-history-of-irish-ceili-dancing/>.

³⁴² Anne Daye, 'The Cotillon: Its Origins, Development and Demise', *Historical Dance* 4, no. 4 (2022): 25–38.

³⁴³ 'June Quadrilles, a Popular Brazilian Festival Folk Dance, Officially Recognized as National Cultural Expression', Planalto, accessed 18 May 2026, <https://www.gov.br/planalto/en/latest-news/2024/06/june-quadrilles-a-popular-brazilian-festival-folk-dance-officially-recognized-as-national-cultural-expression>.

³⁴⁴ James Leach and Scott deLahunta, 'Dance Becoming Knowledge: Designing a Digital "Body"', *Leonardo* 50, no. 5 (2017): 464, https://doi.org/10.1162/LEON_a_01074.

³⁴⁵ This statement is not one that relies on liveness as the fundamental mechanism of meaning-making within dance works, but it does implicate co-presence as an important element.

performance environment, and of engaging a kinaesthetic empathy with the performer. For Leach and Delahunt, this same relationality generates political and social meaning:

We concur that the social and the political cannot pre-exist movement and relation because they are always made into being in movement and relation. Dance is a modality in which this coming into being is explored in experimental, innovative patterns and events. It is “thinking” precisely because thinking in movement is an exploration of the unfolding human relation.³⁴⁶

In devising a series of spontaneous invitations within the dance, where the dancer moved through the crowd, offering a moment to connect and spin through the space, generating and exposing a series of relations.³⁴⁷ The potential barrier to connection that the aesthetics of the suit, with its flashing lights (indicating that the sensors were working correctly) might cause was a concern, in that it held the potential to “other” the dancer from those he invited to engage. To counteract this, we chose to shroud the theatre in darkness, illuminated only by the flashing lights of the PN suit and the live visuals, both on the screens and on the body of the dancer himself.³⁴⁸ This also functioned as a way of reducing the sensation of “being watched”. Both the design of the space (i.e. the decision to show the work in the round, with some audience members sitting and some standing) and the choreography of the invitation were designed in such a way that the participant felt in no way obligated to engage, only choosing to do so should they feel comfortable or compelled.

If movement brings into being the social, political dimensions through relationality with the other, then it is reasonable to propose that the “other” in this case can be understood not only as the audience, but as the motion capture system which both enmeshes itself with the dancer through its wearability, and stands entirely independently of the user in its operational capacity. But this understanding of the technology (as an independent entity) misses the fact that it is its relationality to the dancer that brings into being its own subjectivity. The dancer gives the technology life, so to speak, in the same way that a puppeteer breathes life into their puppets. What is different in this instance however is that unlike a puppet, whose expression is entirely reliant on the puppeteer, the relationship between dancer and technology is multidirectional, and (usually) mediated by

³⁴⁶ Leach and deLahunta, ‘Dance Becoming Knowledge’, 465.

³⁴⁷ Performance footage illustrates this – see Appendix C

³⁴⁸ Rehearsal footage - see Appendix C

a technologist.³⁴⁹ Additionally, unlike a traditional puppet, which exists as a single, independent entity, the technology used here must be understood in the context of a broader system; as a product of a corporate entity, engaged in market economics. In the case of *The Front*, the relationship between dancer and technology is broadly mutualistic, with each entity benefitting from the relationship. It is also true however that the relationship between dancer and technology more broadly can be understood as a sliding scale from mutualism to parasitism. This is to say that the balance of power shifts when one entity begins to extract from the other, directly or indirectly causing harm.³⁵⁰

If we accept that the mocap system functions as relational “other”, generating meaning through its interaction with the dancer's body, then traditional consent frameworks become inadequate. Consent typically assumes a transaction between human agents, but here the dancer is entering relationship with a technological entity that has its own temporal rhythms, data requirements, and corporate affiliations. The ethical question becomes: what does informed consent look like when one party in the relationship is a distributed technological system with undisclosed secondary uses for the relational data being generated? Additionally, the same embodied knowledge that generates kinaesthetic empathy in the audience; Yves’ movement patterns, breathing rhythms or spatial relationships, is precisely what the mocap system captures and processes. The audience experiences these as way of generating a meaningful connection; the technology captures them as extractable data. This creates a troubling parallel: while the audience receives embodied knowledge as gift within the performance encounter, corporate systems receive it as resource for indefinite future use. The intimacy that makes the work powerful for audiences also makes it valuable for data harvesting.

4.2.6 Reflection and Evaluation: Dance, Data and Dance Data

To restate what I have explored previously in chapter 2, the mocap technologies used here struggled to quantify the parts of dance movement that stretch beyond the mathematical logics that underpin the system. Through developing a movement vocabulary of spirals, curves, abstract bodily configurations and audience-performer interaction, *The Front* actively challenges assumption of dance as a “product of multiple calculations – of

³⁴⁹ This is particularly true of live performance, where the flow of data from the dancer through the motion capture suit is rendered through a game engine by a creative technologist.

³⁵⁰ Harm here is broadly understood as “evil (physical or otherwise) as done to or suffered by some person or thing; hurt, injury, damage, mischief.” ‘Harm, n. Meanings, Etymology and More | Oxford English Dictionary’, accessed 9 February 2026, https://www.oed.com/dictionary/harm_n.

repeatable steps, gestures and bodily movements that can be accurately executed or played”.³⁵¹ This interpretation assumes the translation of dance from an embodied form to a series of equations, from which a representation (visual or otherwise) can be derived, and from which inferences can be made about the choreographic score and relationality to the audience. The calculation, analysis and modelling of dance through computational media can result in the destabilisation of the data because the various architectures of the software act as filters through which the data is passed and which prioritise different aspects thereof.³⁵² As such, the filtering process reveals that what we understand as “dance data” is always already shaped by the technological systems designed to capture it. There cannot therefore exist a “natural category of data...without preconditions”,³⁵³ and so it must be understood within the corporate and cultural systems that transform embodied knowledge into an extractable resource.

The term “dance data” has emerged over the last thirty or so years, in tandem with rapid developments in science and technology, and has expanded the study of dance from domains such as anthropology and ethnology, where its appraisal as a cultural practice was paramount, into new epistemic and technical spaces, where its generation, processing and collection have greatly augmented and reconfigured the scope of the term.³⁵⁴³⁵⁵ Its use as a catch-all, rife with ambiguity however is frequent. Computer scientists often refer to “dance data”, meaning “dance movement data” or “motion capture”; the subtext implying that dance is the outcome of bodies executing a careful choreography in a particular spatial or temporal configuration.³⁵⁶ This understanding of dance implicates movement as its most relevant characteristic, prioritising its capture for preservation, documentation and transmission. This approach is particularly evident in the context of

³⁵¹ Kriss Ravetto-Biagioli, ‘Dancing with and within the Digital Domain’, *Body & Society* 27, no. 2 (2021): 4, <https://doi.org/10.1177/1357034X20979033>.

³⁵² Ibid.

³⁵³ Miguel Escobar Varela, *Theater as Data - Computational Journeys into Theater Research* (University of Michigan Press, 2021), 4.

³⁵⁴ Carla Fernandes et al., *Dance Data, Cognition, and Multimodal Communication*, Routledge Advances in Theatre and Performance Studies (Routledge, 2023).

³⁵⁵ Raul Masu et al., ‘How Do Dancers Want to Use Interactive Technology? Appropriation and Layers of Meaning Beyond Traditional Movement Mapping’, *Proceedings of the 9th International Conference on Digital and Interactive Arts* (New York, NY, USA), ARTECH ’19, 13 February 2020, 1–9, <https://doi.org/10.1145/3359852.3359869>.

³⁵⁶ Fernandes et al., *Dance Data, Cognition, and Multimodal Communication*.

cultural heritage.³⁵⁷ Whilst it can be argued that this work is of vital importance, it cannot be argued that in creating an elemental hierarchy atop which movement sits, that this form of recording and preserving encapsulates the more subtle or nuanced details of the dance. In fact, it excludes any information regarding the cultural or production context, or the intentionality of the movement, to name just a few other constituent parts. Whilst these types of technologies “do not record human experience but data”,³⁵⁸ they effectively engage in the task of shaping relations between technological systems and human experience, exposing broader cultural transformations. This reveals what Edmond et al. identify as datafication’s fundamental limitation:

in order to transform culture into data, its elements – as all phenomena that are being rendered as data – have to be classified, divided and filed into taxonomies and ontologies. This process of ‘data-fication’ thereby robs them of their polysemy, or at least reduces it.³⁵⁹

This reduction in cultural polysemy raises the question of what we understand as “meaningful”. To whom, and for what purpose, are the various facets of data meaningful? For example, digital data regarding the frequency of my visits to my local café (say, from my Google Maps history) holds personal meaning to me as an expression of my habits and routines, but it becomes very valuable to Google as targeting data for advertising. It acquires a different meaning as algorithmic input rather than lived experience. Similarly, Yves’s embodied movement patterns, which are meaningful to us as cultural and artistic expression, acquire commercial value as training data for algorithm development or other purposes.

Through its creative process, *The Front* posits a multi-layered approach to data. It concerns movement data, or that which can be formally translated from the body of the dancer to a visual construct through motion capture technologies; social data, arising from the relationship between performer and audience and through which meaning is derived; and relational data stemming from the dynamic relationship between audience, artists and technology. This process challenges existing taxonomies that attempt to stratify the ways

³⁵⁷ Kico et al., ‘Digitization and Visualization of Folk Dances in Cultural Heritage’; Hajdin et al., ‘Digitization and Visualization of Movements of Slovak Folk Dances’; Stavarakis et al., ‘Digitization of Cypriot Folk Dances’.

³⁵⁸ Bleeker, *Transmission in Motion*, xx.

³⁵⁹ Jennifer Edmond et al., *The Trouble with Big Data*, Bloomsbury Studies in Digital Cultures (Bloomsbury Academic, 2022), 3.

in which dance data can be fed into a computational analysis of motion data, focusing only on representational forms of data that are generated through dance. For instance, Varela's suggestion that motion can be represented in three ways; through concepts, notations or numerical data, does not encapsulate the relational or social data that, as I have already argued, are critical in the generation of meaning through dance.³⁶⁰

To return to the idea that dance improvisation often exposes much about the improviser, this multi-layered data framework helps to tease apart data significance in the expression and subsequent capture of embodied knowledge through improvisation. The data pathway which went from Yves' improvisation to its structuring, performance and visual rendering, was captured, analysed, and archived by the technology. His "interior", which Steigler articulates as the private realm (for instance his polyrhythmic instinct or his specific weight transfer patterns, both of which are culturally specific) was accessed through the process of improvisation, and exposed not only in a time-bound performance, but captured and stored by the software and networks through which it was rendered.³⁶¹ The concern that Steigler raises through the "disappearance of the "interior""³⁶² is that in effect, access to "interior" data through engagement with technology renders visible ephemeral details about the self, which may be stolen, sold or exploited in service of data harvesting and/or financial gain by any number of media or technology conglomerates under the global capitalist economic models of contemporary Western society.³⁶³ The practice of data harvesting, or information harvesting, appears to sit in contradiction with capitalist models that prioritise short-term profit generation, as its value is typically realised over time through algorithmic refinement. This should be considered however within the context of Byung-Chul Han's notion of psychopolitics, a successor to Michel Foucault's biopolitics. Han argues that within the context of neoliberalism, mental processes are now the primary target of power, and hence that biopolitics, with its primary focus on the body, no longer provides an appropriate lens through which to establish a critique of the system.³⁶⁴ While Han's psychopolitics retain problematic Cartesian

³⁶⁰ For a full descriptor, see Escobar Varela, *Theater as Data - Computational Journeys into Theater Research*, 117.

³⁶¹ Steigler, *Technics and Time, 2: Disorientation*.

³⁶² Ibid, 77.

³⁶³ Jathan Sadowski, 'When Data Is Capital: Datafication, Accumulation, and Extraction', *Big Data & Society* 6, no. 1 (2019): 2053951718820549, <https://doi.org/10.1177/2053951718820549>; O'Dwyer, *Digital Scenography*; Edmond et al., *The Trouble with Big Data*.

³⁶⁴ Byung-Chul Han, *Psychopolitics: Neoliberalism and New Technologies of Power*, trans. Erik Butler (Verso, 2017).

assumptions that I have already dispensed with earlier in this chapter, this framing lends weight to the idea that information repositories (containing data relating to individual preferences, habits, political inclinations, etc) in the eyes of technology or media conglomerates, are akin to an untapped goldmine.

The shift towards understanding data as capital further underscores its value to contemporary capitalism; Sadowski argues that although data as a form of capital holds its own distinct form, it has its roots in economic capital and is driven by the same perpetual cycle of capital accumulation.³⁶⁵ It can be understood as a “core component of political economy in the 21st century”.³⁶⁶ To put it another way, the commodification of data in service of surveillance, profiteering, system optimisation, statistical modelling or political influence, amongst other things, lends itself to the notion that “..the fantasy of data seems to have established itself as a contemporary fetish object, touted as ‘the new oil’”.³⁶⁷ This comparison to oil, the fuel of industrialisation does not stop there; the language of data “mining” further embeds this idea of data as the engine of economic growth and post-industrial development.

4.2.7 Digital Traces

Before the dancer, Yves Lorrhan, enters the performance space, there exists a visual trace of him. Yves’ digital representation, generated through his wearing of the mocap suit, preconditions both the space and the audience relationality. His digital traces, represented visually as an abstract particle system, denotes his positioning (and ultimately theirs) in a hyper-industrial global economy,

founded on the condition that everything and everyone create traces (a digital footprint)...that are recorded, stored, prepared, and re-routed to big data sets, so that calculations can be performed on them by high-performance computers.³⁶⁸

As he begins to move through the choreography, his digital avatar races across the screen in shades of blue and purple. The dancer’s body is lit only by the flashing of the mocap suit sensors, and the projection of his own data back onto him (see Figure 25). He cuts through the space vertically, diagonally, spiralling through and with the audience. His

³⁶⁵ Sadowski notes that this is a relatively recent shift; as recently as 2016, “paying for storage did not seem like a good investment”. ‘When Data Is Capital’, 1.

³⁶⁶ Ibid.

³⁶⁷ Edmond et al., *The Trouble with Big Data*, 21.

³⁶⁸ O’Dwyer, *Digital Scenography*, 159.

embeddedness in the space, in the people gathered to observe, brings forth a contradiction. He is here, and in an act of artistic generosity, is revealing to them through his movement a snippet of what it means to be him. Conversely, as he does so, the data that he generates is being funnelled through a series of conglomerates, who extract from it that which best serves their interests. As the movement flows from the dancer to motion-capture suit to game engine (and so on, see Figure 26), it is clear that the ownership of this data is slipping far beyond the body of the dancer. If existing data protection legislation like GDPR already recognises that personal data, i.e. information that can identify or relate to an individual, deserves protection from unauthorized extraction and use, then the culturally specific, personally identifiable movement patterns revealed through improvisation should logically fall within this same protective framework. Edmond et al.'s analysis of the European Union General Data Protection Regulation (GDPR) statute, issued in 2018,

..defines three different roles related to data regulation: the data subject (a living person who is either identified or identifiable in data), the data controller (a person, company or other body which decides the purposes and methods of processing personal data) and the data processor (a person, company or other body which processes personal data on behalf of a data controller).³⁶⁹

This framing casts the dancer in the role of the “data subject”, the choreographer as the “data controller” and Noitom Limited (referred to as Noitom)³⁷⁰/Unreal Engine as the “data processor”. Whilst GDPR legislation exists to protect the interests of the originator of the data, it would be untrue to assume that the ownership of the data continues to lie with them. For instance, although Noitom acknowledges that it has no ownership rights over content generated by users of its services, it goes on to state that,

By submitting User Content through the Services, you grant Noitom a worldwide, irrevocable, perpetual (i.e. lasting forever), non-exclusive, transferable, royalty-free and fully sublicensable (i.e. we can grant this right to others) right to use,

³⁶⁹ Edmond et al., *The Trouble with Big Data*, 22.

³⁷⁰ Noitom Limited is the parent company of Perception Neuron/Axis Studio. Although Noitom Limited has its HQ in Beijing, it also hold a subsidiary, Noitom International, Inc, registered in Florida.

copy, display, store, adapt, publicly perform and distribute such User Content in connection with the Services.³⁷¹

If Noitom deem it their right to do, in effect, anything they please with user data without explicit consent, one might ask what exactly the difference is between this and ownership. Further, Noitom's privacy policy is opaque in its commitment to data protection. It "endeavours to comply with all rights you may have under data protection laws" and only stores personal data for "long enough to fulfil the purposes for which the information was collected and processed". Acknowledging that European data legislation differs from US laws (to which Noitom International, Inc, its American subsidiary is beholden), these statements give no firm assurances regarding data handling, processing or storage, expose an undefined retention period and acknowledge that user data is extracted and put to work in the service of marketing, surveillance and other forms of commodification.³⁷² Given the expanding range of inferences that can be drawn from biometric data, this further underscores Sparrow et al.'s assertion that careful consideration must be given to its collection and storage.³⁷³

³⁷¹ Noitom Limited, 'Terms of Service', Noitom, accessed 30 July 2025, <https://ja.neuronmocap.com/terms-of-service>.

³⁷² Though the data policies of Unreal Engine etc are not explicitly analysed here, they are closely aligned with those of Noitom.

³⁷³ Sparrow et al., 'Heart and Soul'.



Figure 25: Lighting via PN and projection (rehearsal image)

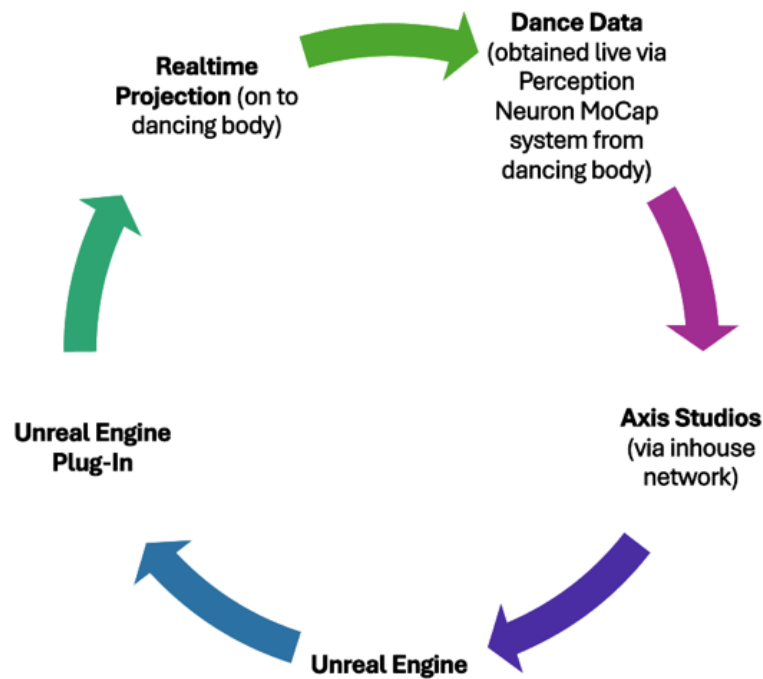


Figure 26: A diagram mapping the data flow in *The Front*

4.3 Reflection: Dance as Work

To return once more to *The Front*, it follows that there lies a tension in the production of personal dance data from the body of a dancer and its subsequent extraction by a series of technological agents, ostensibly in service of an aesthetic and affective theatrical experience. In reviewing the power structure involved in this “exchange”, it is perhaps useful to lay out its precise mechanism. I, the choreographer, hire Yves, a professional dancer. He exchanges his bodily labour for money. He consents to the use of his image solely for the purposes of promotion of the performance and for its documentation. This type of contract between a choreographer and a dancer is based on an established framework of service, limited to development, rehearsal, performance, and activities in service of the promotion of the work. It could be argued here that in performative contexts, the body always operates as a sort of site of extraction, given that its labour is capitalised. However, a critical distinction exists when technological entities become fundamental to both the creative process and to the live performance. As I have already

outlined, in many contemporary dance works, the dancers perform the role of co-creator, developing movement in collaboration with the choreographer. In doing so, the body of the dancer operates as a tool; a means of creating, developing, and performing choreographic material. In an analogue performance space, the exchange pathways of this dance data are clear. The choreographer-dancer-audience triffecta (audience here including audiences for promotional materials) both produces and receives, but it is also the terminus of the data.³⁷⁴ If dance data exists only in this closed loop, then evidently the insertion of technological agents who disrupt this circuit by syphoning data into other, undefined systems for undefined purposes (as is evident in PN's data privacy policy) undermines the classic assumptions underpinning labour relations in this context. It heightens the assertion of theatre as a locus of indirect social relations through further abstracting the relationship between capital and labour.³⁷⁵

In Jen Harvie's analysis of the labour relations in the production of immersive and participatory art, she draws attention to the hierarchical implications of art delegated to contracted workers. This relationality, she contends, requires substantial contributions of expertise from workers, who are often required to suppress their own identity and the breadth of their contributions to maintain "a sense of the artist's autonomy, her status as principle – or genius – creator of her artwork and her celebrity".³⁷⁶ In doing so, she argues, it exposes an attempt to deny art as labour, and resultantly, "to deny the potentially uneven labour dynamics that undergird art".³⁷⁷ Though the contributions of the dancer in the case of *The Front* are undeniable, it is perhaps more useful to understand the production of this labour in the context of postmodern free-market capitalism.³⁷⁸ The emergence of semiocapitalism as a framework, characterised as the integration of the precarisation of labour under the conditions of neoliberalism and the increasingly media-

³⁷⁴ Dance, in its traditional ephemerality, exists only in the very moment in which audience and dancer are engaged through choreography, therefore it does not sustain after that.

³⁷⁵ Michael Shane Boyle, 'Performance and Value: The Work of Theatre in Karl Marx's Critique of Political Economy', *Theatre Survey* 58, no. 1 (2017): 3–23, <https://doi.org/10.1017/S0040557416000661>.

³⁷⁶ Jen Harvie, *Fair Play - Art, Performance and Neoliberalism*, Performance Interventions, ed. Elaine Aston and Bryan Reynolds (Palgrave Macmillan, 2013), 49.

³⁷⁷ Ibid.

³⁷⁸ The project of postmodernism, as Fredric Jameson understood it, involved collapsing the high (existing largely outside of the market on the basis of exceptionalism) and low culture (commercial, or existing only for the market) binary. This integration resulted in the understanding that everything can be culture and is analogous to Beradi's contention regarding the commodification of time through the disintegration of the distinction between labour and leisure time, resulting in our constant engagement with capitalism.

saturated culture with its fixation on the realm of information, communication and discourse, affect atmosphere, desire and signs,³⁷⁹ provides a distillation of contemporary capitalism that is a more appropriate lens through which to examine the type of labour relations under question here.³⁸⁰ It generates a dual-audience model, understood as the physical audience in the room and the technology conglomerates harnessing the dance data in abstracted forms for later use. A further deviation of this relationality frames technological agents as “entrepreneurs”; they obtain data not for their own enjoyment, but in order to transform it into a resource for surplus value generation.³⁸¹³⁸² This new duality challenges traditional labour relations by obscuring the ownership of labour and, in a way, fetishising the digital artifact over the original performance. Through this lens, labour in the context of *The Front* can be conceived of not only as a contract between choreographer and dancer (through development and performance of choreography and placing a financial value thereon) but also in the generation of dance data which is extracted and capitalised by technology corporations that are integrated in the development and performance of the work. This extends the frame of labour relations as they pertain to the development of technologically mediated dance works beyond what is understood as “normal” contracting in the performing arts. Equally, and perhaps more importantly, it illuminates new directionalities of the power dynamics at play.

4.4. Practice Findings

The making and performance of *The Front* revealed five significant findings. The process of task-based improvisation during the development process surfaced culturally specific and personally identifiable embodied knowledge, including Yves’s capoeira equilibrium and samba polyrhythms. This finding reframes improvisation not only as a choreographic methodology, but as a phenomenological act that renders visible the interior of the performer that persists beyond the performance itself, captured and stored by the technological systems through which the work was rendered. If GDPR already recognises

³⁷⁹ Hesselberth, ‘Creative Control’.

³⁸⁰ Compositionism is the lens used in the development of this framework. Other thinkers of note include Italian philosopher Paolo Virno, Antonio Negri and Maurizio Lazzarato, whose ideas were influential in the development of the concept of semiocapitalism.

³⁸¹ Karl Marx, Theories of Surplus Value, in Karl Marx and Friedrich Engels Collected Works, vol. 31, Marx 1861–1863, trans. Emile Burns, Renate Simpson, and Jack Cohen (London: Lawrence & Wishart, 2005), 21–2.

³⁸² This is only partially accurate; classical Marxist understanding assumes that “an entrepreneur of theatres...buys [my emphasis] the temporary disposal over the labour-power of the actors”. This is untrue of the technological actors engaged in *The Front*, as most of the services that we utilised had to be paid for by the production company who commissioned the work.

that personally identifiable data deserves protection from unauthorised extraction and use, then the culturally specific movement knowledge emerging in *The Front* through improvisation should logically fall within that same framework. By tracing the data flow after the performance, a second finding emerged. *The Front* had two simultaneous audiences – the live audience in the room, and the technology corporations whose systems processed and retained the same knowledge as extractable data. This dual audience model was not conceived of in advance as a theoretical framework, but emerged only through a retrospective analysis of how data moved from the dancer's body, through the corporate technology platforms of mocap suit, game engine and plugins, back into the physical performance space as scenography. The intimacy of the work for audiences is also what made it valuable for data harvesting, and both processes occurred simultaneously and without any framework to govern the second. It also forced a reconsideration of the conditions of artistic labour in this context, revealing the inadequacies of current models. A third finding from this practice work implicates consent across realities as a significant challenge for existing frameworks. Creating *The Front* exposed the destabilisation of traditional models, which can be understood as a transaction between human agents at a fixed point in time, by drawing out its new conditions. When one agent is a distributed technological system with undisclosed secondary uses for the data being generated as per its terms of service, as Noitom was, the assumption of informed consent as a key component of creative labour conditions disintegrates. The platform claimed effectively perpetual, transferable rights over the movement data produced during rehearsal and performance, and this could not have been consented to by the performer in advance of the work. This finding also illuminated the responsibility of those at the top of the creative hierarchies in deciphering the actual working conditions in advance, and empowering performers to engage meaningfully with these new conditions.

As I have argued in chapter 2, choreography can operate as a form of technology through shared logics and materialities, and during the development of *The Front*, the bodily logic of the dancer was integrated into the enmeshment of logics at play in the studio. What emerged was a vivid tension – his embodied samba rhythm against my eight-count choreographic structure. In other words, the imposition of a metrically rigid structure onto a movement tradition that operates through polyrhythmic suspension. The reconciliation of these logics was not simply a practical challenge – it produced a finding

about how technological systems can compound rather than neutralise existing power asymmetries in the studio, and how choreographic decisions can carry colonial weight that the adoption of technology can obscure rather than resolve. Finally, when taken together, these four findings generate the fifth. No single existing framework, from Equity to Sparrow et al's BEAP, was adequate for managing the conditions that *The Front* generated. Rather than a gap identified through an early scoping of best practice guidance, it was revealed only through the act of making. The five-strand ethical framework proposed in this chapter is therefore not a theoretical contribution applied to performance, it is a practice-generated response to conditions that theory had not yet accounted for. Chapter 5 extends this by placing these findings in conversation with the industrial policy landscape, examining where the gaps between practice and regulation are most acute and what a practice-informed policy response might look like.

4.5 Towards an Ethical Framework

The studio development and subsequent performance of *The Front* exposed five ethical dimensions requiring systematic attention. Firstly, on how the structures of technology encode particular movement practices and bodies as “normal”. Secondly, how dataflows extend beyond the performer's body and the performance context. Third, how power dynamics operate at multiple scales, from studio hierarchies to global capitalism, Fourth, the innovation required when consent mechanisms designed for human–human interaction are rendered obsolete. Finally, how critical practice might resist rather than merely accommodate some of the extractive logics at play in this type of work. My proposal here is not one that applies in a general way, to all users of wearable technology. Instead, it is a provocation to those of us who integrate technology which has the capacity to generate, collect and store biometric data, into our work with embodied practices. If, as I have contended in earlier parts of this chapter, I, as the choreographer, sit close to the top of the creative and economic hierarchy that structures the development of this work, then it is my professional duty to ensure that those with whom I work are respected and cared for. This includes the materials that they and I bring into the process. I have articulated how, through structured improvisation, the “interior”³⁸³ of the dancer is exposed, moulded, and shaped into choreographic material, which through the fusing of

³⁸³ Stiegler, *Technics and Time, 2: Disorientation*.

body and technology, is transformed into dance data. For Berardi, language³⁸⁴ under semiocapitalist cycles of production freezes its affective potencies. In other words, the growing abstraction of work from its useful function under the financialised economy conditions language in a way that transforms it into fragmented, quantifiable data (for example hashtags or keywords), reduced to a mere tool of exchange. It becomes abstracted from its bodily dimension. This is precisely the mechanism through which dance too, can be reduced to movement data. Poetry, however “..is language’s excess: poetry is what in language cannot be reduced to information, and is not exchangeable, but gives way to a new common ground of understanding, of shared meaning: the creation of a new world”.³⁸⁵ In essence, because poetic language escapes “the order of exchangeability”,³⁸⁶ it functions as a sort of disruptor of the system which attempts to subjugate it. For instance, in *The Front*, the dancer’s digital body is composed of particles, rendered through a particle system plug-in through the game engine. This visual expression of choreographic material through a composite, abstract body evokes the layers of abstraction that technology as an agent of semiocapitalism, forces. But evading capture in this example is the *rhythm* of the work; its affinity to time and space; its composition, and its relationality to its context. Sometimes, dance is referred to as “poetry in motion”, though perhaps it is the case that poetry itself is motion; an art whereby “words...become the equivalent of bodies, and the way they are arranged in print could be called verbal choreographic patterning”.³⁸⁷ In writing about the mechanics of both artforms, the poet and dance critic Jack Anderson notes their formal parallels, but more importantly suggests that “both poetry and dance remain incorrigibly unpredictable, capable of surprising us at any moment”,³⁸⁸ in other words, these shared sensibilities suggest *what* evades technological capture and thus the incomplete capitulation of these forms to datafication.

The Front posits that performance can operate as a counterweight to some of the effects of datafication on embodied practice through critical engagement with technology,

³⁸⁴ Language here is understood as that which is spoken, written and otherwise codified, as opposed to say movement language.

³⁸⁵ Franco Berardi, *The Uprising: On Poetry and Finance*, Semiotext(e) Intervention Series 14 (Semiotext(e), 2012), 147.

³⁸⁶ Ibid, 22.

³⁸⁷ Jack Anderson, ‘On the Move: Poetry and Dance’, *Dance Chronicle* 33, no. 2 (2010): 252, <https://doi.org/10.1080/01472526.2010.485904>.

³⁸⁸ Ibid, 262.

improvisation and social dance traditions. It prioritises embodied presence, audience relationality and collaborative creation, but, as this analysis demonstrates, it acknowledges the vulnerabilities to data extraction inherent in creating work with these types of technologies, suggesting that there are some ethical dimensions that need attention. This is not a new finding, given Sparrow et al.'s contribution to the field, and SAG AFTRA and Equity's specific agreements as they relate to motion capture and performance capture. Whilst these are helpful starting points, the union agreements fall short beyond considerations on fair pay and intellectual property rights,³⁸⁹ and the work of Sparrow et al., *Biometric and Ethics in Artistic Performance (BEAP) Framework* lacks practitioner perspective on how the ethical concerns they have generated through scoping the field manifest in the actual collision between collaborators, contexts and technologies in artistic practice. Similarly, while the work acknowledges the complexity in conversations on the use of biometric data on the grounds of "artistic merit", its framing risks maintaining the extractive logic of semicapitalism by treating embodied knowledge as a resource to be weighed against creative outcomes.

A growing body of work situates dance either as an embodiment of ethical practice,³⁹⁰ a domain in which ethical applications can be identified and extended more broadly,³⁹¹ or a locus for the integration of institutional ethics with domain specific procedural ethics.³⁹² These frameworks and philosophical insights provide a useful place to begin from, but none of them consider explicitly what happens when technology, and its associated practices, are embedded into the discipline. The gap between theoretical recognition and practical application is evident even in the most relevant existing work. In "Wearing Data: Intensions and Tensions of Art and Design in Performance using Wearables", Camille Baker and Kate Sicchio come the closest to a proposal for an ethical positioning when engaging emerging technology in the creative process, but fails to lay out any distinctly practical guidelines around its integration into a process.³⁹³ Most

³⁸⁹ These are legal frameworks, as distinct from, say, ethical considerations for best practice.

³⁹⁰ Aili Bresnahan et al., 'Dance as Embodied Ethics', in *The Routledge Companion to Performance Philosophy*, First issued in paperback, ed. Laura Cull Ó Maoilearca and Alice Lagaay, Routledge Theatre and Performance Companions (Routledge, 2020).

³⁹¹ Aili Whalen, 'Dance Ethics', in *The Oxford Handbook of Ethics and Art*, ed. James Harold (Oxford University Press, 2023); Fiona Bannon, *Considering Ethics in Dance, Theatre and Performance* (Springer International Publishing, 2018), <https://doi.org/10.1007/978-3-319-91731-3>.

³⁹² Candelario and Henley, *Dance Research Methodologies*; Naomi M. Jackson, *Dance and Ethics: Moving towards a More Humane Dance Culture* (Intellect books, 2022).

³⁹³ Baker and Sicchio, 'Hacking the Body 2.0'.

recently, Correia and Primett lay out a series of best practices for technology-mediated audience interaction in dance performances, but its focus lies on the audience rather than attending to the performer or other relationalities.³⁹⁴ Sparrow et al.'s BEAP framework identifies the following seven question matrix as a departure point: 1) Who is biometric data (not) being collected from? 2) What biometric data is being collected? 3) What is the biometric data taken to indicate? 4) How is biometric data being collected? 5) How is biometric data being used in relation to the performance or artwork? 6) How is biometric data being managed? 7) Why is biometric data being collected?³⁹⁵ Although useful, this matrix is limited in its engagement with power dynamics as they relate to the creative process and the destabilised labour relations it produces.

As a caveat to what follows, the ethical principles I will outline below should be read only as a starting point or a provocation; they are not conclusive or binary and support a flexible, “ethics by design” approach.³⁹⁶ As Bannon reminds us,

Ethics concern our behaviours as individuals, beyond allegiance to any one fixed moral code. In our modes of collaborative practice, what is important is the manner in which we each engage in ethical work, that we each appreciate that ethical work is relational and in association with the others with whom we correspond.³⁹⁷

This notion of ethical flux is at once logical and deeply uncomfortable. It requires us to engage deeply and reflexively in each process, and to leave space for their variations. For Candelario and Henley,

..ethics—including a consideration of bias, systemic racism and other -isms, and equity—must form the foundation of any research process. Further, they must be recursively reconsidered throughout the process, including the sharing phase of performance and publication, and beyond.³⁹⁸

³⁹⁴ Nuno N. Correia and William Primett, ‘Best Practices for Technology-Mediated Audience Interaction in Dance Performances’, *Proceedings of the 9th International Conference on Movement and Computing*, 30 May 2024, 1–6, <https://doi.org/10.1145/3658852.3659083>.

³⁹⁵ Sparrow et al., ‘Heart and Soul’, np.

³⁹⁶ Ibid, np.

³⁹⁷ Bannon, *Considering Ethics in Dance, Theatre and Performance*, 215.

³⁹⁸ Candelario and Henley, *Dance Research Methodologies*, 21.

Whilst this approach was developed and applied specifically within the context of research undertaken in institutions, it is reasonable to apply it to a creative process that occurs externally given the many parallels that exist. Further, Candelario and Henley propose that research ethics, when reduced to a series of safeguards for human subjects through the articulation of risks, avoidance of coercion and seeking consent, does not fully encapsulate the opportunity that many research situation present, where a deeper reflection on the micro and macro ethical implications is warranted.³⁹⁹ The integration of procedural, relational and situational ethics provides a framework through which a mode of creating, producing and performing dance though or alongside technology might be executed in a more thoughtful way.⁴⁰⁰ The following five areas form the basis of an ethical schema, as it relates to the development of dance works with emerging technology at its core, emerging from the development and performance of *The Front*. It is structured around how embodied data moves through power relationships in technologically mediated performance. The five principles operate as an interconnected system rather than isolated considerations. Understanding technological structures shapes how we approach data collection, while power dynamics determine the conditions under which meaningful consent becomes possible. Critical practice integration provides the reflexive mechanism through which the other principles are continuously renegotiated throughout the creative process, preventing the framework from calcifying into procedural compliance.

i. On Considering the Structures of Technology

The very structures of technology, and resultantly that data which is prioritised, “necessarily reflect and propagate the ethical and aesthetic value systems of their designers, whether intentionally or not”.⁴⁰¹ In other words, it is not neutral. The technology industry is broadly known as having one of the widest gender gaps, with the UN reporting that less than one third of jobs in the technology sector and 22% of jobs in

³⁹⁹ Ibid.

⁴⁰⁰ Procedural ethics refer to the institutional guidelines that govern the requirements for ethical research, including obtaining consent, minimising risk and ensuring voluntary participation. Relational ethics acknowledge the duty of care embedded in the researcher-participant relationship. Situational ethics recognise the context-specific decision making that is contingent on the unique circumstances and dynamics of a research process.

⁴⁰¹ Teoma J. Naccarato and John MacCallum, ‘Critical Appropriations of Biosensors in Artistic Practice’, *Proceedings of the 4th International Conference on Movement Computing*, 28 June 2017, np, <https://doi.org/10.1145/3077981.3078053>.

AI are held by women globally.⁴⁰² Consultancy firm PWC estimate that only 5% of leadership roles in the tech industry are held by women.⁴⁰³ Not only does a lack of diversity in development teams shape emerging technology in the interests of those professionals represented at the metaphorical table, but it risks locking consumers into reproductions of these same binaries, capitalist structures and systemic prejudices that are at the very core of our technological applications.⁴⁰⁴ The data that is prioritised in systems developed in a heavily gendered space is usually the systematic, ordered, rational, and detailed forms of knowledge, but does not lend space to “work that focuses on care and messiness”.⁴⁰⁵ This is to say that considering what the limitations and structures of the technologies reflect about the conditions of their development can be of service in attempting to avoid perpetuating systems of oppression or discrimination.

Similarly, a consequence of the lack of diversity in development teams in the technology sector is that the resulting hardware often doesn’t account for so called “non-normative” bodies.⁴⁰⁶ Non-normative bodies are here understood as any body that is not medium sized and male. It has been my own experience that suits such as Perception Neuron have not fitted my female, able-bodied frame, thus leading to capture inaccuracies. Naccarato and MacCallum report similar findings, though the body of the dancer in their research had Parkinson’s, and thus their “non-normative” body produced “non-normative” data.⁴⁰⁷ As they outlined,

It was apparent, and not surprising, that the reference point of the system was situated in the body of the choreographer who seemed to view the non-normative movements of otherly-abled individuals as problematic”.⁴⁰⁸

⁴⁰² United Nations, ‘Technology and Gender Equality—Bringing Women and Girls to the Centre of Innovation’, United Nations, United Nations, 2023, <https://www.un.org/en/un-chronicle/technology-and-gender-equality%E2%80%94bringing-women-and-girls-centre-innovation>.

⁴⁰³ PWC, *Women in Tech: Time to Close the Gender Gap* (2017), <https://www.pwc.co.uk/women-in-technology/women-in-tech-report.pdf>.

⁴⁰⁴ Rob Kitchin, ‘Thinking Critically about and Researching Algorithms’, *Information, Communication & Society* 20, no. 1 (2017): 14–29, <https://doi.org/10.1080/1369118X.2016.1154087>.

⁴⁰⁵ Aristeia Fotopoulou, ‘Understanding Citizen Data Practices from a Feminist Perspective: Embodiment and the Ethics of Care’, in *Citizen Media and Practice: Currents, Connections, Challenges*, ed. Hilde C. Stephansen and Emiliano Treré (Routledge, 2020).

⁴⁰⁶ This is specific to wearables, e.g. motion capture suits.

⁴⁰⁷ Naccarato and MacCallum, ‘Critical Appropriations of Biosensors in Artistic Practice’.

⁴⁰⁸ Ibid, np.

To remedy this, the system engaged in noise-reduction and normalisation of the data input, which they argue,

leads to an erasure of context, as well as normalized interpretations and representations of bodies. When we remove all divergent behaviour from a biosignal, because it does not fit our expectations of how the body usually acts, or should perform, we delimit our capacity to observe bodily differences.⁴⁰⁹

Whilst gender diversity and accessibility are two distinct issues in themselves, they serve a similar function here in bringing to mind the question of how, and by whom, these systems are being developed.

Key Questions for Practitioners:

- 1) Whose bodies and movement practices does this technology serve?
- 2) What aspects of embodied knowledge might it fail to capture?
- 3) How might technology requirements reproduce existing inequalities in creative spaces?
- 4) How are situations handled if technology imposes movement constraints that conflict with a performers' cultural practice?

Practical Guidelines:

- Test motion capture systems across diverse body types and movement practices before implementation
- Document system limitations and test what movement qualities it prioritises or obscures
- Consider alternative capture methods if primary systems prove inadequate, or create spaces for movement approaches that resist capture (for instance, some somatic practices)

ii. On Data

As I have argued earlier in this chapter, dance data, broadly defined, is in many cases deeply personal and bears the hallmarks of the originator of that data. When mediated by technology, it is translated into a series of code and processed through any number of

⁴⁰⁹ Ibid.

programmes, either in a closed network or uploaded to the cloud. The privacy policies and data usage agreements vary between corporations (despite policy initiatives like GDPR), and an understanding of the practical implications of data processing is critical in obtaining informed consent from performers. Equally, a recognition that data can be processed, sold or retained by corporations places this type of work into the broader economic system, and while “theatre contributes minimally or not at all to the social reproduction of capital, [it] does not change the fact that it can conform to the rules of capitalist production”.⁴¹⁰

Key Questions for Practitioners:

- 1) Whose data is being collected and how?
- 2) What is the potential data pathway that our system facilitates?
- 3) What rights do software platforms claim over movement data produced during rehearsal or performance?
- 4) Could an individual be identified from the biometric data being collected and/or displayed?
- 5) How can performers meaningfully consent to unknown future uses of their embodied knowledge?

Practical Guidelines:

- Map the complete data pathway from capture to storage, including all corporate intermediaries
- Provide performers with plain-language explanations of terms of service for technological platforms
- Establish clear protocols for data retention, deletion, and secondary use
- Create contracts that specify data usage rights separately from performance rights
- Regularly audit cloud-based systems for changes in data policies

iii. On Power Dynamics

Care regarding the power dynamics in any creative or research process is fundamental to its success. In a creative process, this includes economic power distribution and

⁴¹⁰ Boyle, ‘Performance and Value’, 18.

transparency and the appropriate attribution of creative input.⁴¹¹ The insertion of technological agents (and in turn, the potential appropriation of data in service of capitalism) obfuscates the precise labour relations through digital abstraction. For Berardi,

transformation and production no longer happen in the field of bodies, and material manipulation, but in the field of interoperativity between informational machines. Information takes the place of things, and the body is cancelled from the field of communication.⁴¹²

Therefore, it cannot be said that a fee paid to a performer who is engaging with and producing digital dance data, is solely on the basis of their physical labour output; rather, it might also fund the purchase of their digital data which should be clarified from the outset.

Key Questions for Practitioners:

- 1) How is labour that generates both artistic and commercial value fairly compensated?
- 2) Do performers hold any decision-making authority over the types of technology that an artistic process engages with?

Practical Guidelines:

- Acknowledge choreographer/director responsibility for technological choices and their implications, but consider creating decision-making processes that include performers in technological choices
- Establish transparent financial arrangements that account for data labour beyond physical performance
- Develop protocols for addressing conflicts between artistic vision and performer comfort with data extraction

⁴¹¹Jackson, *Dance and Ethics*.. It should be noted that the inverse of this is also true – collaborators should also have a right to anonymity, should they so wish.

⁴¹² Berardi, *The Uprising*, 104.

iv. On Relational Consent

Considering distributed systems in performance, which includes not only human-human transactions but other non-human agents (e.g. software and hardware systems) necessitates a revised framework of engagement and consent in performance. As a helpful starting point, Correia and Primett propose a series of best practices in the development of audience engagement or interaction with technologically mediated works. These are 1) understanding the audience and cultural context; 2) overcoming factors inhibiting engagement; 3) strategies to facilitate interaction and 4) consider critical and ethical aspects.⁴¹³

Other Key Questions for Practitioners:

- 1) How do we maintain meaningful consent when working with distributed technological systems?
- 2) What protocols allow performers to maintain agency through the creative process?

Practical Guidelines:

- Establish ongoing consent mechanisms for performers to modify or withdraw consent during the creative process
- Develop protocols for audience interaction that respect both performer agency and audience comfort

v. On Critical Practice Integration

To draw this chapter to a close, through a close analysis of the development and performance of *The Front*, the

deployment of a critical art practice that interrogates the calculation (and the impact it has on the technical, cultural, political and economic landscapes) could help re-route public attention towards the significance its omnipresence and the ontological and epistemological agency it has in modernised societies.⁴¹⁴

⁴¹³ For a full description of these strategies, see Correia and Primett, 2024.

⁴¹⁴ O'Dwyer, *Digital Scenography*, 166.

In other words, critical engagement through art is an important way to draw attention to the ever growing power that technology has in our day-to-day lives. Through ongoing negotiation with ethics and criticality in artistic processes, new insights and ways of working can emerge. Further, it can strengthen rather than constrain creative practice by fostering more thoughtful, inclusive and sustainable approaches to embodied performance.

Key Questions for Practitioners:

- 1) How does our engagement with technology serve or undermine our broader artistic and political commitments?
- 2) How can I develop mechanisms to address ethical concerns without stopping creative momentum?
- 3) Who can help me think through all this?

Practical Guidelines:

- Integrate reflection into regular rehearsal and development processes.⁴¹⁵
- Establish working models for addressing ethical concerns as they arise during development
- Consider artistic strategies that interrogate rather than just accommodate technological requirements
- Build relationships with technologists and artists who understand and engage with similar practices

To conclude, these principles should be understood as a series of provocations that require recursive consideration throughout the creative process and may require adaptation for other contexts or specific technologies. It acknowledges its own instability given the speed of technological development but posits a point from which to begin.

⁴¹⁵ See Appendix F for a reflective template

Chapter 5. The Practice-Industrial Policy Nexus

5.1 Introduction

This body of work has utilised embodied methodologies and a practice-as-research approach to investigate, and subsequently articulate, the mechanisms through which the insertion of immersive technology into dance praxis fundamentally reshapes its boundaries (necessitating new temporal architectures, spatial considerations and audience conceptualisations), reconstitutes the posthuman performing body as distributed, technologically-mediated assemblage (the somatic chora), and requires new ethical frameworks to guide its creation when extractive data flows transform embodied cultural knowledge into a commodity. Each one of these facets arose because of the last: recognising the performing body as a membrane through which reality is renegotiated is only relevant when the foundational elements of choreographic practice necessitate it. Similarly, if the meaning of the body and its role in the creative process is altered, then it follows that the frameworks of care that boundary the process must too shift. Chapters 2, 3 and 4 developed theoretical and practical frameworks and ethical principles for practice – this chapter extends those findings by placing them in conversation with the industrial policy that currently underpins the sector.

The sector is expanding; in the UK in 2022, the immersive sector generated approximately £1.4bn in turnover⁴¹⁶ and in Ireland in 2022, the sector generated revenues of €43 million - by 2024 this had risen by €92 million.⁴¹⁷ In its 2024 report, Immersive Experience Network, a UK-based social enterprise that supports the development of new immersive work and audiences, outlined nine separate genres. These included immersive or interactive theatre, immersive audio, transmedia and alternate reality games, and location based virtual or augmented reality experiences.⁴¹⁸ As artists and publics come in frequent contact with this sector, the need for adequate protections becomes more urgent,

⁴¹⁶ Immerse UK and Oxford Insight & Data City, *2022 Immersive Economy Report* (2022), https://iuk.immersivetechnetwork.org/wp-content/uploads/2022/10/Immersive-Economy-2022-final-13-Oct.pdf?_gl=1*39p3k1*_ga*MTU2NjE3NDA3MC4xNzU5MzU1Mzg5*_ga_2G8QEMVR71*czE3NTkzNTUzODgkbzEkZzEkdDE3NTkzNTU1NDAkajI4JGwwJGgw.

⁴¹⁷ Skillnet Ireland, 'Immersive Tech Industry to Grow up Almost €1tn by 2030', *The Irish Times*, n.d., accessed 9 February 2026, <https://www.irishtimes.com/sponsored/2024/06/27/immersive-tech-industry-to-grow-up-almost-1tn-by-2030/>. Similar growth trajectories are assumed in the UK context, though reliable figures are unavailable.

⁴¹⁸ Immersive Experiences Network, *Immersive Audiences Report 2024* (2024), <https://immersiveexperience.network/wp-content/uploads/2024/06/IEN-Audience-Report-2024.pdf>.

yet current frameworks lag behind practice. Equity,⁴¹⁹ the performing arts and entertainment trade union which operates on behalf of over 50,000 performers and creative practitioners in the UK and Ireland,⁴²⁰⁴²¹ positions its guidance for working with motion capture and performance capture technologies within the video game sector. This framework assumes discrete bodies, bounded performances and one-time data capture, assumptions which, as this thesis reveals, are clearly inadequate in the context of live immersive performance. Hence, this chapter seeks to further unpack the growing need for thoughtful, practice-informed ethical frameworks that push beyond the legal imperatives of labour union negotiations and propose an extension and reapplication of Equity best-practice policies to address the needs of this specific sector.

5.2 Equity and its existing framework

As Equity outline in their 2024 press release announcing their recommended minimum rates for video game performers in the UK, there is currently no collectively bargained agreement with video games companies to set union-agreed minimum rates and to pay performers fairly.⁴²² This is despite the video games industry being worth almost £8bn.⁴²³ For context, the performing arts sector in the UK is worth approximately £2.39bn.⁴²⁴ In addition to these pay recommendations, Equity have published two guides targeting video game companies and performers, entitled “Best Practice for Video Game Companies”⁴²⁵ and “Working as a Video Game Performer”.⁴²⁶ It has also launched an Artificial Intelligence Toolkit,⁴²⁷ which seeks to provide guidance to performers on their rights in relation to AI. Though the research at hand does not engage in a meaningful way with AI

⁴¹⁹ This analysis will also reference and analyse some relevant SAG-AFTRA guidelines, but US labour relations and legal frameworks differ significantly to European contexts. For this reason, engagement is limited.

⁴²⁰ Equity, ‘About Us’.

⁴²¹ Though Equity is a British union, Irish Equity and UK Equity have committed to working together for the harmonisation of contracts across borders.

⁴²² ‘Minimum Rates Set for Video Game Performers in UK First’, Equity, 7 August 2024, <https://www.equity.org.uk/news/2024/game-on-equity-set-recommended-minimum-rates-for-video-game-performers-in-uk-first>.

⁴²³ Ibid.

⁴²⁴ SOLT and UK Theatre, ‘Investing in Theatre’, UK Theatre, 1 July 2024, <https://uktheatre.org/investingintheatre/>.

⁴²⁵ Equity, ‘Equity Best Practice Guidance for Video Game Companies Engaging Performers’, Equity UK, 6 August 2024, <https://www.equity.org.uk/media/1wynyegu/best-practice.pdf>.

⁴²⁶ ‘Working as a Video Game Performer’, Equity, 1 August 2024, <https://www.equity.org.uk/advice-and-support/sector-specific-advice/video-games/working-as-a-video-game-performer>.

⁴²⁷ ‘AI: Know Your Rights’, Equity, accessed 9 February 2026, <https://www.equity.org.uk/advice-and-support/know-your-rights/ai-toolkit/ai-know-your-rights>.

as a discrete technology,⁴²⁸ some of the guidance provided is applicable to broader immersive performance contexts. What follows is a brief analysis of existing industry recommendations, across video games, AI, and theatre, framed by the terms of immersive performance.⁴²⁹

5.2.1 AI

Following consultation with its performer members in 2022, Equity devised an AI Vision statement, which outlines an artist centred, eight principle approach for the industry to adopt when engaging artists for the purposes of “performance cloning”. As per Equity’s definition, this is a process “of creating a synthetic performance by recording, using or reproducing the performance, voice or likeness of an Artist by machine learning systems and equivalent technology”.⁴³⁰⁴³¹ Of course, performance cloning is just one aspect of AI usage in performance and the exclusion of its rapidly expanding capabilities across performance contexts is a significant oversight. For instance, real-time responsive environments, live interactive characters, movement coaching or generative script or score generation are just some of its possible uses, beyond performance cloning.

The eight pillars proposed by Equity are as follows:⁴³²

1) Consent (and not consent) for past, current, and future performances

This pillar stipulates that artists retain inalienable rights to consent to any use of their performance, voice or likeness by AI systems, regardless of previous contractual arrangements predating generative AI technology. Historic performances and existing contracts cannot be interpreted as authorising AI reproduction without the artist’s explicit written consent.

2) Limited use

⁴²⁸ Though the research does not engage with AI as a distinct tool, some of the technologies used in the works incorporate forms of AI. This reading of Equity’s AI vision suggests that it is concerned only with generative AI, but of course, if we broaden the scope of AI, its integration is visible in many immersive technologies. For instance, some motion capture systems use computer vision and machine learning to approximate skeletal position. Similarly, AI algorithms underpin the Meta Quest Pro headset perception capabilities.

⁴²⁹ To note- the Equity theatre agreements are behind a membership paywall, and at present, I do not have access to the original documents.

⁴³⁰ ‘Understanding AI’, Equity, accessed 9 February 2026, <https://www.equity.org.uk/advice-and-support/know-your-rights/ai-toolkit/understanding-ai>.

⁴³¹ ‘AI Vision Statement’, Equity, accessed 23 October 2025, <https://www.equity.org.uk/advice-and-support/know-your-rights/ai-toolkit/equitys-ai-vision-statement>.

⁴³² Ibid.

For specific projects, it is the right of artists to license performance, voice, or likeness on personal, non-exclusive and time limited basis.

3) Moral rights

The right to be identified and to object to derogatory treatment of their performance and work lies with artists.

4) Transparency

Artists have the right to audit and access information about how their professional contributions are used, requiring producers and engagers to report relevant information in good faith and insisting on the same from commercial partners.

5) Consultation

The ethical and just pathway towards adoption of AI technologies in the creative sector requires meaningful consultation with artists and their trade unions, including historically marginalised voices.

6) Equal treatment

Significant inequities in access to work, income inequalities, and wage gaps for those artists most marginalised in the industry already (e.g. deaf, neurodivergent and disabled artists) must not be further perpetuated by rapid technological developments; therefore, the right to equal access and equal treatment must be built into the models of work generated by AI.

7) Fair remuneration

Artists have the right to fair and proportionate remuneration (including after death) that reflects industry standards and the length and scope of agreed usage. This should reflect the reality that digital copies can, if allowed, exist in perpetuity.

8) Collective bargaining

Strong collectively bargained agreements negotiated by artists unions underpin a equitable sector, and artists have the right to be engaged under such terms, with minimum rates of pay and terms and conditions that reflect technological innovation.

These are headline ideas; whilst laying a foundation for the treatment and rights of artists working with AI (and, in my view, immersive technology more broadly), these

ideas have not been interrogated to their ends. They assume discrete, bounded performance conditions which are fundamentally challenged by the dynamics of live immersive performance. They cannot account for networked, agentive co-creation in performance contexts, nor do they address the globalised nature of data-sharing, or hybrid embodiments. They are mostly founded on existing legal frameworks and exclude the ethical implications of conditions for which there is currently no, or outdated, legislation.

5.2.2 Video Games

The Recommended Rate Card for performers working in the video games industry was developed in 2024 and clearly dovetails with the eight pillars outlined above but is significantly more specific.⁴³³ While it acknowledges recommendations in relation to fair pay developed by SAG-AFTRA, it is distinct therefrom given the unique contractual practices of both contexts. For instance, the Equity hourly rate is significantly higher than the SAG-AFTRA rate, but all SAG-AFTRA sessions are booked in blocks of four hours. Additionally, in the USA, agents normally take a 10% commission, and SAG-AFTRA demands a 16.5% Health/Retirement contribution from the accrued fee.⁴³⁴ Hence, there is significant variability across the fee structures, dependent on the specific economic context.

Its two areas of concern in this recommendation are Voiceover and Motion/Performance Capture (mocap/p-cap). For both categories, it includes recommendations on minimum fees per session; usage buyouts (a one-time payment to the performer in exchange for relinquishing ongoing or residual rights to additional compensation); integration (developers must pay a pre-purchase integration fee when incorporating AI systems that will retain performance data for potential reuse across future projects, otherwise usage is limited to the originally contracted project only); likeness (visual representation of an actor in a video game, through scanning, modelling or mocap) and overtime. Provisions for voiceover artists also include time constraints for vocally stressful sessions; DLC (additional downloadable content or expansions that can

⁴³³ 'Video Games Recommended Rate Card', Equity, 6 August 2024, <https://www.equity.org.uk/advice-and-support/sector-specific-advice/video-games/video-games-recommended-rate-card>. This was developed specifically for those working on AAA Games, or games that are created and released typically by mid-size or major publishers. This is in keeping with Equity's existing agreements for film and theatre, which distinguish between scales of production.

⁴³⁴ SAG-AFTRA, '2025 Interactive Media Video Game Agreement', accessed 9 February 2026, <https://www.sagaftra.org/contracts-industry-resources/interactive/2025-interactive-media-video-game-agreement..>

be downloaded and added later is subject to minimum fees, or if a year or more has passed since the original recording, then a new buyout applies); sequel (subject to increased fees for returning characters and new buyout) and promotion (generation of work specifically for adverts, trailers etc). Mocap/p-cap directives also include minimum fee for rehearsal periods. It is unclear why DLC, sequel and promotional directives are not also applied to mocap/p-cap performers.

The intersection of the framework developed in response to the challenges of AI and best practice guidance for video-game performers is clearly seen in concerns regarding transparency of commercial terms, fair remuneration, equal treatment, and moral rights. In addition, video-games performer guidance stipulates fair non-disclosure agreements, contracts in advance, clear payment terms, normal labour conditions as they relate to working hours, appropriate risk assessments, and explicit content/intimate scene considerations, including advanced scripts and story outline, and adherence to the Mental Health Charter. The common threads underscore perhaps the most challenging elements in working with immersive technology, but those specific to video-games guidance illuminate the ways in which existing frameworks may be transposed into a new context. As I have outlined, many of the existing recommendations are based on existing legal precedents and best practice guidance - they are reactive, rather than proactive. My assertion is that this is not enough; to develop ways of working that both enact a duty of care for the artist *and* facilitate the innovation that these technologies might inspire, it is necessary to engage more deeply by articulating the theoretical and practical implications of making live performance work with immersive technologies.

5.3. Extending through PaR

5.3.1 Co-Agentive Performance Making

As I have demonstrated throughout this project, the insertion of technology into the choreographic process, and the acceptance of its agentic nature therein, alters not only the outputs, but the very modes of procedural organising. This is not a new finding. In the Heideggerian sense, technology is a form of thinking that reveals a singular mode of existence. It is a way of conceiving and behaving that will consider only instrumental considerations, where everyone and everything becomes part of a “standing reserve”

awaiting use. He calls this process “enframing”.⁴³⁵ But the standing reserve is not created equally; in co-agentic performance making, this “enframing” process can force alignment between human and machine agencies around specific movement values.

In arguing for the relevance of “enframing” in this context, it can be understood to operate not only on individual bodies, but on entire cultural knowledge systems. This places immersive technological systems at risk of perpetuating colonial patterns of extraction and commodification. When embedded within colonial power structures, the enframing process can become a tool for systematically privileging certain cultural knowledge whilst marginalising others. This risk is not hypothetical; when working in the studio with a Brazilian dancer during the making of *The Front*, the issue of time, and *timing*, as the potential imposition of a colonial construct, arose as a point of ethical contention.⁴³⁶ One way of conceiving of time is as an ordering technology, a means of structuring our rotations around the sun through progressive, layered and interoperable units. Of course, time has not always been considered linear; many civilisations predating our own in the last two to three hundred years have “tended to regard time as essentially cyclic in nature”.⁴³⁷ The shift towards linear time was largely contemporaneous with the rise of the money economy, where the emphasis on mobility placed value on time.⁴³⁸⁴³⁹ Many thinkers, including Fabian and Foucault have explored oppressive uses of time. Foucault locates a distancing of punitive measures from techniques imposed *on* the physical body towards “an economy of suspended rights”.⁴⁴⁰ Here, the body becomes subjugated not to physical violence and humiliation, but to a system of constraints and privations, obligations and prohibitions. In Foucault’s reading, modern punishment operates beyond the public sphere, its tactics becoming “a bureaucratic concealment of the penalty itself”⁴⁴¹ and constituting a form of political tactic. A primary formulation is visible in disciplining through time-regulated systems, wherein “time penetrates the body

⁴³⁵ Martin Heidegger, ‘The Question Concerning Technology’, in *Technology and Values: Essential Readings*, ed. Chris Hanks (Blackwell Publishing, 2010), 100.

⁴³⁶ See chapter 4 for further discussion.

⁴³⁷ G. J. Whitrow, *What Is Time?* (Oxford University Press, 2003), 2.

⁴³⁸ Ibid

⁴³⁹ While Newton’s establishment of “absolute, true and mathematical” time in the 17th century gave time as we understand it in contemporary western societies its linearity, Einstein’s theory of relativity in the 20th century challenged its universality. However, our ideas of progressive time are still largely under a Newtonian influence. Whitrow, *What Is Time?*

⁴⁴⁰ Michel Foucault, *Discipline and Punish: The Birth of the Prison*, 2nd Edition, trans. Alan Sheridan (Vintage Books, 1995), 11.

⁴⁴¹ Foucault, *Discipline and Punish*, 10.

and with it all the meticulous controls of power”.⁴⁴² Although this specific line of Foucauldian thought is focused on disciplining individual bodies, it is inherently linked to his broader system of biopolitics through the appropriation and statisticalisation of time. These dispersed, micro-level relations are strategically coordinated and amplified into larger systems of population management.⁴⁴³ Although attributing the genesis of population control through temporal structuring to a later moment in history than Foucault, Fabian also identifies political time as an ideologically constructed instrument of power. Interpersonal, intergroup, and international time is “public time – there to be occupied, measured, and allotted by the powers that be” in service of one part of humanity; its dominant class.⁴⁴⁴ This colonial-capitalist nexus becomes explicit in Shippen’s analysis of temporal commodification. Shippen argues that in the “colonization of time...the social use, meaning, organization, and experience of time are dominated by the needs of capital, rather than the needs of human beings”.⁴⁴⁵ In other words, through the creation of abstract time to which human activities ought to subscribe, its scarcity commodifies time, making it available for consumption.⁴⁴⁶ In this framing, if immersive technology is developed under these conditions, its temporal logic is likely to be reflective of the context of its development. In *The Front*, a tension emerged between the temporal framework of the dancer, rooted in the polyrhythms of samba, and the mocap suit’s linear logic, expressed through its refresh rates, network time and rendering cycles. This temporal clash exemplifies how capitalist development conditions embed themselves in capture systems. Structures are underpinned by the assumption that all bodies move in linear, metric time and hence bodies operating in other temporal frameworks are vulnerable to losing their specificity in capture.

Beyond temporal inheritances, mocap’s enframing also encompasses movement vocabularies. Choreographically, this was visible in both *Art.i.Fact* and *The Front*, where the logics both reflected and challenged the technological prioritisation of specific movement vocabularies. The mocap technology captured symmetrical movements

⁴⁴² Foucault, *Discipline and Punish*, 152.

⁴⁴³ Lazzarato, ‘From Biopower to Biopolitics.’

⁴⁴⁴ Johannes Fabian, *Time and the Other: How Anthropology Makes Its Object*, 3rd Edition (Columbia University Press, 2014), 144.

⁴⁴⁵ Nichole Marie Shippen, ‘Introduction’, in *Decolonizing Time: Work, Leisure, and Freedom*, ed. Nichole Marie Shippen (Palgrave Macmillan US, 2014), 2, https://doi.org/10.1057/9781137354020_1.

⁴⁴⁶ Thabolwethu Tema Maphosa and Refiloe Makama, ‘From Colonial Time to Decolonial Temporalities’, *British Journal of Social Psychology* 64, no. 2 (2025): e12817, <https://doi.org/10.1111/bjso.12817>.

grounded in classical ballet technique that characterise the choreography in *Art.i.Fact* more accurately than it did the spirals and weight shifts that anchor the form of *The Front*. The quantification of the “functional parts of dance movement”⁴⁴⁷ by these capture technologies decontextualise it, rendering “genres of dance as standardised practices constructed of elemental components that can be assembled or disassembled in technological and impersonal modes”.⁴⁴⁸ This reinforces Heidegger’s “enframing” theory, inserting dance movement, with no regard to its originator, into a system that reveals only one way of being. In discordant frameworks, the systematic privileging of certain cultural knowledge by technology emerging from epistemologies of power and authority risks activating digital colonialism.

This is not an example of technical determinism; rather, the capacity to draw out these logics through practice opens possibilities for designing immersive systems that accommodate diverse temporal knowledge. It opens avenues for exploring how performers maintain agency over culturally specific embodied knowledge, or how the extractive properties of immersive technology might be contained in performance. More broadly, by engaging with these underlying logics, the opportunity to ask how algorithmic systems might homogenise movement across cultures arises. There is historic precedent for similar processes of homogenisation in performance practices, which can be read as manifestations of the same underlying process. Singleton’s distillation of intercultural theatre in France in the 1980s and 1990s outlines how “the source culture...was not simply passed through an hourglass to emerge in French culture as something other; it emerged as neither autochthonous nor even French, but universal, with universalist impulses and drives, images and sounds”.⁴⁴⁹ In the same volume, Daphne P. Lei locates tension in the enforcement of techno-globalism as a national policy, which so fundamentally alters the practice of jingju as to force jingju artists to sacrifice its very

⁴⁴⁷ Zhou et al., ‘Dance and Choreography in HCI’, np.

⁴⁴⁸ Strutt, ‘Motion Capture and the Digital Dance Aesthetic: Using Inertial Sensor Motion Tracking for Devising and Producing Contemporary Dance Performance’, 135.

⁴⁴⁹ Brian Singleton, ‘Interculturalism and Migration in Performance: From Distant Otherness to the Precarity of Proximity’, in *The Palgrave Handbook of Theatre and Migration*, ed. Yana Meerzon and S.E. Wilmer (Palgrave MacMillan, 2023), 96, <https://doi.org/10.1007/978-3-031-20196-7>. Brian Singleton, ‘Interculturalism and Migration in Performance: From Distant Otherness to the Precarity of Proximity’, in *The Palgrave Handbook of Theatre and Migration*, ed. Yana Meerzon and S. E. Wilmer (Palgrave MacMillan, 2023), 96, <https://doi.org/10.1007/978-3-031-20196-7>.

essence.⁴⁵⁰ These articulations underscore my assertion that the adoption of immersive technology in performance practices requires concerted efforts to determine the relational power dynamics in *whose* movement traditions are being captured, and whether the technological logics underpinning the capture process offer an appropriate mechanism through which to do so.

5.3.2 The Posthuman Performing Body

These patterns of cultural extraction and homogenisation through immersive technology operate not only on the level of knowledge systems but reshape the ontological status of the performing body itself. In his analysis of mediated performance and the posthuman, Remshardt points to the fact that although in academic discourses, “we increasingly understand how media redefine *each other*, we poorly understand how they redefine the performer and the performance itself”.⁴⁵¹ Based on my analysis of Equity’s frameworks above, I argue that is also true in industry policy contexts, where bodies are assumed to be discrete, not technologically mediated. The emergence in my practice work of the posthuman performing body as a somatic chora, a membrane actively negotiating between realities, necessitates reconceiving how the performing body is cared for in technologically mediated contexts. This remediated body, which is fragmented, distributed, and hybrid, poses a challenge to the notion of discrete, bounded performance and necessitates new practical considerations.

Perhaps one of the most pressing issues for consideration of the posthuman performing body is how consent is managed. This is a twofold issue; firstly, consent as it pertains to data usage, storage etc, which is discussed later; and secondly, whether consent can in fact be obtained, when simultaneously inhabiting several realities at once. In making *Untitled*, my immersion in both the physical theatre and in the virtual world we built simultaneously suggests that consent should operate on two layers, with explicit provisions for the ways (if any) in which harm might befall a performer in virtual spaces. While *Untitled* involved solo dual-inhabitation (i.e. I was alone in virtual space), this concern becomes more acute in social VR performance contexts, where virtual audiences or participants might interact with a performer’s virtual presence. Current frameworks

⁴⁵⁰ Daphne P. Lei, ‘Diasporic Trauma, Nativized Innovation, and Techno-Intercultural Predicament: The Story of Jingju in Taiwan’, in *The Palgrave Handbook of Theatre and Migration*, ed. Yana Meerzon and S.E Wilmer (Springer International Publishing, 2023), <https://doi.org/10.1007/978-3-031-20196-7>.

⁴⁵¹ Ralf Remshardt, ‘Beyond Performance Studies: Mediated Performance and the Posthuman’, *Cultura, lenguaje y representación: revista de estudios culturales de la Universitat Jaume I*, 2008, 50.

assume singular physical presence and have no mechanism for addressing harm that occurs in virtual space yet affects the physically embodied performer. A lack of consensus on the precise definition of harm and fledgling social norms in social VR spaces make establishing practices of consent challenging, but an emerging body of HCI research has advocated for its use as a guiding lens for understanding and designing solutions to mitigate against harm in social VR;⁴⁵² reframing it as a process of boundary creation;⁴⁵³ or developing consent mechanics through interaction design.⁴⁵⁴ These approaches offer methodological starting points for building out policy frameworks for live performance contexts.

Under current Equity guidance, risk assessments for cases of mocap or performance capture aim to carry out “shoot specific risk assessments...for each shooting block”, and ensure a competent stunt coordinator is on set to “advise on safety and decide whether the performer is competent to perform physically demanding action”, alongside some conventional welfare provisions.⁴⁵⁵ Interestingly, provisions for vocal safety are significantly more developed, including providing clear expectations around the amount of time or number of lines that require vocal combat or extremes, limited durations for stressful vocal sessions, scheduling guidance to facilitate performer recovery and ongoing attention and coordination between collaborators to ensure continuously safe working conditions. If vocally stressful performances constitute a distinct category in terms of both rates of pay and welfare practices, then level of stress as a determinant in the application of both of these areas should also apply to artists working in dual-reality performance, due to the potential for physical and psychological stress in the navigation of dual realities. Though physical strain from extended mocap or headset wearing during long performances should also be considered here, the unique challenge of dual-reality performance is the cognitive and somatic load of maintaining simultaneous embodiment

⁴⁵² Douglas Zytke and Jonathan Chan, ‘The Dating Metaverse: Why We Need to Design for Consent in Social VR’, *IEEE Transactions on Visualization and Computer Graphics* 29, no. 5 (2023): 2489–98, <https://doi.org/10.1109/TVCG.2023.3247065>.

⁴⁵³ Kelsea Schulenberg et al., “‘We Don’t Want a Bird Cage, We Want Guardrails’: Understanding & Designing for Preventing Interpersonal Harm in Social VR through the Lens of Consent’, *Proceedings of the ACM on Human-Computer Interaction* 7, no. CSCW2 (2023): 1–30, <https://doi.org/10.1145/3610172>.

⁴⁵⁴ Josef Nguyen and Bonnie Ruberg, ‘Challenges of Designing Consent: Consent Mechanics in Video Games as Models for Interactive User Agency’, *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (New York, NY, USA), CHI ’20, 23 April 2020, 1–13, <https://doi.org/10.1145/3313831.3376827>.

⁴⁵⁵ Equity, ‘Equity Best Practice Guidance for Video Game Companies Engaging Performers’.

across multiple realities, which current risk assessment frameworks do not address. Therefore, the prior recognition of specialised care for certain performance modes opens the door for provisions for this type of work.

Beyond consent and welfare concerns, distributed embodiment as a function of the somatic chora, or membrane, creates vulnerability to technological failure. In *Untitled*, when the Oculus Quest Pro lost its zero point, or orientation point, the sudden disorientation caused a fall risk. This loss of spatial coherence across realities underscores that, unlike traditional constructions of the body which fall because of physical instability, for posthuman bodies, technological failure destabilises the membrane itself. The harm did not originate in either the physical or digital realm alone, but in the collapse of the negotiation between the two. Protecting the posthuman body as somatic chora then requires protecting not simply the virtual presence or physical body as discrete entities, but rather the technological systems that enable their ongoing negotiation.

Consent across realities, distributed embodiment as a stressor, and vulnerability to technological failure, represent three important facets in discussions on ethical conduct with immersive technology. They reveal that current frameworks are predicated on discrete, bounded conceptions of the performing body, and therefore cannot account for the extensions that the posthuman body gives rise to. Hence, new approaches must recognise the posthuman performing body as technologically mediated assemblage rather than a singular physical entity.

5.3.3 Data

Of the ethical considerations that live immersive performance demands, data ethics is both the most developed practically and theoretically and yet is still inadequate for the conditions we now operate within. The reason for this dichotomy is that data ethics in technology have been grounded in significant legal frameworks since at least 1995, when the EU passed the European Data Protection Directive, establishing minimum data privacy and security standards.⁴⁵⁶ Specifically, the EU General Data Protection Regulation, which passed the European Parliament in 2016, and has been mandatory for all organisations since 2018.⁴⁵⁷ In theory, GDPR protects the data privacy rights of European citizens through its applicability to non-EU organisations engaged in

⁴⁵⁶ Ben Wolford, 'What Is GDPR, the EU's New Data Protection Law?', *GDPR.Eu*, 7 November 2018, <https://gdpr.eu/what-is-gdpr/>.

⁴⁵⁷ Ibid.

professional or commercial activity - but only if it offers goods or services, or monitors their behaviour.⁴⁵⁸ The mechanisms through which these regulations apply to creative labour contexts remains unclear, and given the increasingly interconnected, globalised economy we find ourselves in, it is difficult to imagine a scenario in which it is possible to trace a dataflow from its origin right through to its final point of use. However, this legal framework has proved a useful basis for the development of some recent industry guidance on data processing that could be adapted for use in live performance contexts.

In making *Art.i.Fact*, I did not and could not have consented to the processing of my movement data in an informed manner, because no creative agreement outlining how my data might be used during or after live performance exists. Equally, it is unclear still who exactly owns that data after it has been processed and cycled through the various software entities during the development of the work. Recent developments in video game performer agreements offer potential models for addressing these gaps. In July 2025, SAG-AGTRA, the American labour union, ratified its new Interactive Media Video Game Agreement, which “accomplishes performer safety guardrails and gains around A.I., including consent and disclosure requirements for A.I. digital replica use and the ability for performers to suspend consent for the generation of new material during a strike”.⁴⁵⁹ Although it was negotiated with specific video-game companies on behalf of SAG-AFTRA members and does not technically apply in live performance contexts, it does leave a provision for ascertaining whether a performer’s “Digital Replica will be used for Real-Time Generation”.⁴⁶⁰ Meaning, that any use of a performer’s vocal digital replica in generating dynamic, real-time voiced dialogue requires explicit consent and additional compensation. Whilst this once again only identifies vocal replicas within its remit for special consideration, it is logical to extend this line of thinking to biometric performance data. Additionally, this agreement stipulates that a usage report must be issued to the performer within 90 days of public release of an interactive program (i.e. video game).⁴⁶¹ Though this is intended to apply to information pertaining to the character

⁴⁵⁸ Ben Wolford, ‘Does the GDPR Apply to Companies Outside of the EU?’, *GDPR.Eu*, 18 November 2018, <https://gdpr.eu/companies-outside-of-europe/>.

⁴⁵⁹ SAG-AFTRA, ‘2025 Interactive Media Video Game Agreement’.

⁴⁶⁰ SAG-AFTRA, ‘Summary of 2025 Interactive Media (Video Game) Agreement’, Screen Actors Guild-American Federation of Television and Radio Artists, June 2025, <https://www.sagaftra.org/sites/default/files/2025-06/2025%20Interactive%20Media%20%28Video%20Game%29%20Agreement%20Summary.pdf>.

⁴⁶¹ *Ibid.*

for which their data was used and compensation calculation, this could in fact be extended in live performance contexts to include a retrospective analysis of data flow, as I undertook after making *The Front*.

A more fundamental challenge arises in the context of data persistence. Immersive works once again break with the understanding of performance as time-bound, distinct entities; live immersive works often create ongoing data streams, potentially far beyond the malleable bounds of the project itself. The persistence and replication of data produced in the development and performance of immersive works challenges long held copyright law. As Equity outline:

Performers' rights include two sets of rights under the Copyright, Designs and Patents Act 1988: the right to consent to the making of a recording of a performance; and the right to control the subsequent use of such recordings, such as the right to make copies of recordings. AI-made performance synthetisation challenges our intellectual property framework because it reproduces performances without generating a 'recording' or a 'copy', therefore falling outside the scope of protection conferred to performances by the Act.⁴⁶²

In other words, unauthorised performance reproduction by AI systems circumnavigates conventional copyright protections by failing to generate a copy. This pronouncement tells us two things: 1) existing intellectual property legislation cannot account for the new conditions the AI imposes on it; and 2) that both Equity and SAG-AFTRA's guidance focuses on obvious, visible AI applications, rather than recognising that AI is already invisibly embedded throughout immersive tech infrastructure, including mocap. As a result, current frameworks miss this deeper technological integration and will continue to do so until there is more substantial engagement with the ways in which the technologies of immersive performance are developed.

Globalisation and its associated interconnectedness in both production and consumption of data flows is a significantly complicating factor in considerations of ownership rights. Which jurisdiction's labour laws apply when data from a performer in Dublin is captured by, say, servers in the Netherlands, processed through US software and

⁴⁶² '80% of Performers Need AI Rights Clarity', Equity, 21 April 2022, <https://www.equity.org.uk/news/2022/4-out-of-5-performers-don-t-understand-their-rights-when-working-with-ai>.

distributed to audiences worldwide?⁴⁶³ Equity's Cinema Films Agreement and Television Agreements support secondary payments, which includes provisions such as royalties, a net profit share or residuals.⁴⁶⁴ The factors influencing the calculation of that payment include the type of production; platform, media and territory in which the performance is being exploited; and several other contractual details.⁴⁶⁵ By contrast, compensation for global digital presence in the video game industry exists as a contractual buyout. Equity's own critique of this practice positions it as incongruent with the rights of performers in film and TV. For immersive contexts, neither of these models fairly account for the ongoing, networked data generation characteristic of live work with persistent digital presence.

These jurisdictional ambiguities are not simply of interest as they relate to fair compensation; rather, they reflect the underlying power structures that govern global digital infrastructures. It would be negligent to obfuscate the neo-colonialist tendencies of digital technology, and the often-asymmetrical trade agreements on which they are contingent. With regard to the US context, intellectual property rights are the subject of one of the most significant cultural policy directives resulting from digitisation. Its continuous rise has resulted in the US losing more revenue from infringements of intellectual property rights than any other country.⁴⁶⁶ New, multi-pronged trade strategies and a 70-year extension of copyrights from its Free Trade Agreement partners have been implemented to combat this, but many of the bilateral Free Trade Agreements, which shape digital infrastructure, are with developing nations and thus the power imbalance sits favourably with the US.⁴⁶⁷

Of course, a paradox lies in the ubiquity of digital technologies; as of 2024, 68% of the world's populations use the internet but significant disparities exist between high (93%) and low (23%) income countries, and a further gap is evident along gender lines,

⁴⁶³ This is the specific context of *Untitled*.

⁴⁶⁴ 'Understanding Secondary Payments', Equity, accessed 9 February 2026, <https://www.equity.org.uk/advice-and-support/secondary-payments/understanding-secondary-payments>.

⁴⁶⁵ Ibid.

⁴⁶⁶ Gilbert Gagné, 'Trade and Culture: The United States.', *International Journal of Cultural Policy* 25, no. 5 (2019): 615–28, <https://doi.org/10.1080/10286632.2019.1626843>.

⁴⁶⁷ Ibid.

with 6% more men than women able to access the internet.⁴⁶⁸ If it is the case, as Kwet argues, that “US multinationals exercise imperial control at the architecture level of the digital ecosystem: software, hardware and network connectivity, which then gives rise to related forms of domination”,⁴⁶⁹ then it is incumbent on artists and policy makers to hold this in mind as we move through the process of establishing ethical norms in this increasingly embedded performance mode. Current frameworks do not account for the ways data flows and ownership might perpetuate cultural extraction, where knowledge flows from developing to developed, or from marginalized to dominant cultures, with economic benefits accruing to technology companies rather than originating artists.

5.4. So where to, now?

In interrogating existing policy frameworks, whether rooted in AI guidance, video game labour practices, or broader provisions for performance (for instance, health and safety policies), it is clear that there are significant institutional, legal, ontological, ethical and geopolitical gaps that become particularly acute in immersive performance spaces. This chapter does not seek to provide definitive answers to these gaps; rather, it locates the questions arising from four years of creative engagement with immersive technology within the current policy landscape.

Existing policy assumes discrete, bounded bodies and performance contexts, favour contractual buyouts, and take a reactive rather than proactive stance. Such models cannot address the distributed, posthuman performing body; the persistent, global data flows that immersive performance can generate; or the multilayered dynamics of consent – both consent to participate *and* consent to data capture and usage. For choreography, this insufficiency is not merely technical but artistic and ethical – it risks eroding culturally specific embodied knowledge, homogenising movement vocabularies, and exposing performers to modes of harm that current guidance cannot identify. Finally, the risk of perpetuating digital colonialism is real; only by surfacing these technological logics can artists, policy makers and audiences begin to develop an ethics of technology that support innovation and creativity without reproducing extractive capitalist modes.

⁴⁶⁸ World Bank, ‘Individuals Using the Internet (% of Population)’, World Telecommunication/ICT Indicators Database, World Bank Open Data, 2024, <https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=XD>.

⁴⁶⁹ Michael Kwet, ‘Digital Colonialism: US Empire and the New Imperialism in the Global South’, *Race & Class*, January 2019, 3, Sage UK: London, England, <https://doi.org/10.1177/0306396818823172>.

When Phillip Auslander first argued that “thinking about the relationship between live and mediatized forms in terms of ontological oppositions is not especially productive, because there are few grounds on which to make significant ontological distinctions.”,⁴⁷⁰ it is improbable that he could have anticipated the technological, social or political transformations and intersections of the last almost thirty years. As my research suggests, there *are* meaningful ontological differences which need attended to now and in looking forward towards what the next thirty years might bring. Beginning by reimagining things like contract language or pre-production protocols; during performance safeguards or post-performance data management offers a starting point rooted in existing ways of working. Achieving industry buy-in, including training and education for practitioners, and finding ways to translate and transpose existing legal or practice frameworks to a new context will likely be foundational in consolidating learning and knowledge in interdisciplinary contexts. More fundamentally, subsequent research should ask what *kind* of frameworks would bolster the type of work it seeks to underpin. The task, then, is to recognising policy making for emergent technologies in live performance not as a static, cumulative process, but as a forward looking, inclusive, and iterative one that meaningfully supports emergent practices in the sector.

⁴⁷⁰ Philip Auslander, *Liveness: Performance in a Mediatized Culture*, 3rd edn (Routledge, 2023), 27, <https://doi.org/10.4324/9781003031314>.

Chapter 6. Conclusion

To draw this body of work to a close, I would like to return briefly to the foundational questions of this project. They were:

- 1) How does choreographic practice integrate immersive and capture technologies to generate new compositional methodologies and creative possibilities?
- 2) What conditions of embodiment, agency and liveness emerge when the performing body is mediated through these technological apparatuses?
- 3) What ethical and collaborative frameworks are required for performance practices when bodily data is extracted, circulated, and mediated through immersive and capture technologies, and how can these be generated through practice-as-research?

Broadly speaking, I have addressed them sequentially: chapter 2 engages with the new conditions of choreographic practice that emerge from the entanglement of dance and technology; chapter 3 offers a novel theoretical contribution to the understanding of hybrid embodiment; and chapters 4 and 5 use practice insights to develop an ethical framework for practitioners, as well as interrogate current industrial policies that (fail to) engage with live immersive performance. These are only the headline outputs of each chapter – in synthesising their original contributions, it is clear that practice-as-research as a model has much to offer by way of novel insights. The methodology of this project has attempted to mitigate some of PaR's most common critiques, primarily relating to often idiosyncratic methods and lack of validity and replicability that traditional research relies on, by using a multipronged data collection system. However, a limitation exists in that no systematic data was collected from audiences, and data from collaborators was limited to informal discussion, recorded through reflective writing on my part. Hence, this research hinges on the perspective of only one practitioner, although the fingerprints of collaboration are recorded in the artifacts themselves. Further, its insights cannot be generalised, even within the performing arts sector. I acknowledge my own complicity in partaking in the same systems I ultimately critique, particularly as it pertains to chapter 4. Ultimately, I engaged in the same labour relations and contracting model that I later argue against, without acknowledging my own perpetuation of it during the process. Nevertheless, this research generates original contributions to the field.

6.1 Original Contributions

The original contributions of this thesis occur across three registers: methodological, theoretical, and practical. I will address each level individually and then offer a synthesis of their interaction.

Methodologically, this thesis generates four compositional innovations: choreography as concretizing technology; a multitemporal framework for hybrid performance; polytemporal, polyspatial spectatorship; and a co-created body schema through apparatus fragmentation. Choreography, in this work, functions as a mediating system between bodies, spaces and cultural meaning. It is fundamentally altered through its enmeshment with another system, and in this case, technological logics become choreographic logics as dance movement is systematised through mocap, which converts embodied movement into transferrable data. Through a process of concretization, live choreographic knowledge becomes technical choreographic object through transformation from disparate mocap elements to integrated visualisation system to unified mediating apparatus. It also instigates a fundamental reshaping of space and time; the ephemeral experience of live performance sits in tension with persistent data harboured by technical systems, revealing multiple overlapping temporalities. These temporalities do not simply coexist – they actively render possibilities for choreographic encounters. Similarly, hybrid realities and the encoded distributed temporalities of network systems (hardware time, software time, network time and experiential time) destabilise traditional analytical approaches to dance, requiring new methods of analysis for hybrid performance. Layered spectatorship and engagement in hybrid works generates a polytemporal, polyspatial spectatorship, a concept that facilitates simultaneous physical and virtual representation. Hence, the situatedness of entities within multiple spatial and temporal flows facilitates their interaction across space and time. They engage in different knotting patterns of presence, attention, and participation, each entangled in a different configuration of the same choreographic encounter. Additionally, in separating the VR headset and its controllers and using only one component per person, this work proposes that by disrupting a VR system's coherent virtual body schema, the body emerges as collaboratively constructed between users, regardless of whether they are performers or observers. The body becomes co-created, reinforcing relational interdependence and illuminating the role of kinaesthesia in linking spaces.

Theoretically, this work offers a spatial and ontological logic for understanding how posthuman embodiment operates. Although Braidotti positions the posthuman as a tool, its use is primarily intellectual, serving as a means to critique and reimagine human subjectivity and embodiment rather than understanding its underlying mechanics. Reframing the posthuman body as a somatic chora, this work proposes that the body can be understood as a responsive site where sensory, spatial, social, and technological conditions are continually negotiated. Said differently, the performing body functions as a membrane rather than a self-contained subject, as both landscape and navigator, simultaneously constructing and traversing physical and virtual terrains. It absorbs inputs including light, sound, digital, proximity or memory and enacts this disruptive potential through movement. Similarly, in this work, choreography does not simply animate the body; it is an activation and reconfiguration of the body as space. It is exposed as a site of emergence, where phenomenological presence is constantly unsettled by technological mediation and spatial instability. In this way, the posthuman body and the body as chora emerge as complementary, mutually reinforcing concepts.

Finally, this project develops and advocates for a reorientation of ethical frameworks towards practitioner-led inputs and proactive, rather than reactive, industry policy. It suggests a multi-layered approach to understanding dance data, incorporating movement data, or that which can be formally translated from the body of the dancer to a visual construct through motion capture technologies. It also includes social data, arising from the relationship between performer and audience through which meaning is derived, and relational data stemming from the dynamic relationship between audience, artists and technology. To understand this embodied expression as data, however, is to understand it within the corporate and cultural systems that transform embodied knowledge into an extractable resource. In conceptualising improvisation as phenomenology, culturally specific, personally identifiable embodied knowledge is surfaced. Its subsequent transformation from dance data to capital, through data harvesting, reveals new challenges for consent processes in performance contracting – what does informed consent look like when one party in the relationship is a distributed technological system with undisclosed secondary uses for the relational data being generated? GDPR already recognises that personal data deserves protection from unauthorised extraction and use, and so this thesis posits that the culturally specific, personally identifiable movement patterns revealed through dance improvisation should logically fall within this same

protective framework. The project also identifies that insertion of technological agents who disrupt the traditional exchange pathways of dance data (choreographer-dancer-audience triad) by siphoning data into other, undefined systems for undefined purposes undermines the classic assumptions underpinning labour relations in this context. It offers semiocapitalism as a framework for understanding these new relations and generates a dual-audience model, understood as the physical audience in the room and the technology conglomerates harnessing the dance data in abstracted forms for later use. This new duality challenges traditional labour relations by obscuring the ownership of labour and, in a way, fetishising the digital artifact over the original performance. The project proposes a five-strand ethical framework for practice: 1 – considering the structures of technology; 2 – data collection; 3 – assessing power dynamics; 4 – obtaining relational consent; 5 – critical practice integration provides the reflexive mechanism through which the other principles are continuously renegotiated throughout the creative process, preventing the framework from calcifying into procedural compliance.

In unearthing and conceptualising the temporal architecture and spatial constructions of the VR and motion capture systems through choreography, the work began to expose the materiality of the technology. Materiality is a commonality; technology and bodies are both composed of multiple, complex, interwoven and malleable material infrastructures. Choreography on the other hand, is a system. It too is composed of a type of materiality, but it functions here as a cross-entity methodology. The collision and reconfiguration of technological and bodily materialities in hybrid environments relies on first recognising them as such. Hence, remediating the body as a function of the somatic chora leaves it fragmented, distributed and hybrid, creating vulnerability to technological failure. These destabilisations uncover the need for new ethical guidance; one of the most pressing issues for consideration of the posthuman performing body is how consent is managed. Firstly, consent as it pertains to data usage and storage, and secondly, whether consent can in fact be obtained when simultaneously inhabiting several realities at once. The technological materialities also expose the potential for systematic privileging of certain cultural knowledge. When their construction emerges from epistemologies of power and authority, technologies including VR, mocap and AI risk activating digital colonialism through flattening, decontextualising and capitalising cultural biodata. These considerations demonstrate the

growing need for practice-informed ethical frameworks that push beyond the legal imperatives of labour union negotiations.

6.2 Next steps

This research has identified critical gaps in current theoretical and ethical frameworks as they relate to embodiment, data ethics and technological structures in the creation and performance of live and mixed-reality artworks. Beyond narrow data ethics considerations, current industry guidance, including from Equity (the British labour union) fails to identify or adequately address these new conditions of immersive performance. The next phase of this research would bridge that divide by extending and translating the findings of this thesis into a robust, implementable framework through a series of collaborative co-design policy labs with artists, producers, technologists, legal experts, and unions, and piloting this in professional productions across diverse performance contexts. It would address three critical, intersecting facets of performance: embodiment (performer's experience of presence across realities), data ethics (ownership, use, compensation, networked performance) and technological structures (embedded biases). Outputs should include an artist toolkit and a policy white paper, providing implementable guidance for working practices with immersive technology in live performance for artists, venues, unions, and arts councils.

This piece of writing opened with an image of a body whose orientation was undone by its technological entanglement. Now, I understand that body differently. It exists not as an illegible, standalone entity; rather, it is redistributed, a somatic chora that has the capacity to traverse worlds, temporalities, and grammars. The method through which this understanding was unveiled is choreography – its mechanisms have offered an opportunity to generate modes of enquiry that would not otherwise have been accessible to me through purely theoretical or policy lenses. This embodied practice gently pulls open the materialities of the body, technological structures and social contexts, knitting and knotting them into new, nuanced ontologies. While I offer some practical pathways forward, I also offer a word of warning: the materialities of technology are in an era of rapid development, and these insights are, as such, timebound. As engineers continue to develop systems that are not designed to account for the complexities of hybrid embodiment and ethical frameworks are built to serve only the narrowest of legal definitions, artists risk losing control over their digital likeness, being subjected to inequitable digital labour practices and being exposed to physical or psychological harm

when performing across realities. However, in placing the body of the artist at the centre of the enquiry, the body offers more than simple endurance of systems; it renegotiates and generates the knowledge required to rewrite the rules of engagement.

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8. Appendices

Appendix A: *Art.i.Fact*

Art.i.Fact Documentation:

Full recording:

<https://youtu.be/PlVKQnTdfJk>

Studio Mocap Test – Perception Neuron:

<https://youtu.be/ZziNy9STpLE>

Studio Mocap Test – Vicon

Vicon Test 1: <https://youtu.be/3RyDdmnm9Qc>

Appendix B: *Traversing Spaces*

Traversing Spaces Documentation:

A permalink to the documentation can be found on TARA, TCD repository.

Appendix C: *The Front*

The Front Documentation:

A permalink to the following documentation can be found on TARA, TCD repository.

- Performance Reel
- Studio Rehearsal
- Testing MoveAI

Testing Scenography:

<https://youtu.be/RrDANzTAvqo>

Appendix D: *Untitled*

Untitled Documentation:

Phase 1 – Dislocation of VR Body Schema through separation of VR apparatus

Test 1 - <https://youtu.be/ONr7nk0RUNk>

Test 2 - <https://youtu.be/dn5iQPVzR70>

A permalink to the following documentation can be found on TARA, TCD repository

- Phase 2 – (de)(re)construct
- Phase 3 – Full Rehearsal Video
- Phase 3 - Edited Video

Appendix E: Related XR Dance Works

Title	Company	Technology	Year
Dancing the Portico	National Gallery & Tony Adigun	180 Video, VR	2019
AbstrACTION	Bright Side Studios	360 Video, VR	2017
Between Being Asleep and Awake	Chou Tung-Yen Chou Shu-Yi Very Theatre	360 Video, VR	2013
Free UR Head	Chou Tung-Yen Very Theatre	VR, Participatory Live Performance	2023
8 Degrees of Freedom	Chou Tung-Yen Very Theatre Hung Yi-Po	VR, Participatory Live Performance	2025
Facades	Kerryn Wise	360 Video, VR	2021
Go to Blazes	ANU Productions CoisCéim Dance Theatre	180 Video, VR	2022
Francis Footwork	CoisCéim Dance Theatre	180 Video, VR	2019
PAAR	Carly Lave Dr Christian Stein Arishi Jain	360 Video & MoCap	2022
GOLEM	Carly Lave	Realtime MoCap, VR	2019
Living Archive	Wayne McGregor	AI Tool	2019
Nino	Gibson/Martelli	Realtime MoCap, AI	2025
Wow & Flutter	Gibson/Martelli	AI, MoCap	2024
Pan & Tilt	Gibson/Martelli	Pre-Recorded MoCap, VR	2022
Dazzle	Gibson/Martelli	Realtime MoCap, VR	2020
Expanded Fields	Gibson/Martelli		2019
We Are Made of Star Stuff	Gibson/Martelli	MoCap	2018
Suga	Valencia James	Volumetric Video, Social VR	2021
Dance in VR	Boston Ballet	360 Video, VR	2021
A Swan's Story	Birmingham Royal Ballet	306 Video, VR	2023
Dance Trail	Cie Gilles Jobin	AR App	2020
La Comedie Virtuelle	Cie Gilles Jobin	Telemetric Performance - MoCap	2022
territory	Kinetic Light	2D filming, VR	2025
Rite of Spring +Mirror	Alexander Whitley	MoCap & AI	2026
Future Rites	Alexander Whitley	VR, MoCao	2026
Anti-Body	Alexander Whitley	Live MoCap	2021
Celestial Motion I & II	Alexander Whitley	Social VR, MoCap	
The Last Swan	Alexander Whitley & English National Ballet	Live MoCap	2025
Whist	Aoi + Esteban	Installation, VR	2017
0AR	Aoi + Esteban	AR	2018
LILITH.AEON	Aoi + Esteban	MoCap, AI	2024
Open Machine	Rashaun Mitchell Silas Riener	MoCap, Live Performance	2025
The Crack Up	Kim Vincs & Steph Hutchinson	Immersive performance, virtual performers	2014
The Guest House	Steph Hutchinson	Realtime MoCap, Hybrid environment	2020
Das Totale Tanz Theatre	Richard Siegal	VR Installation	2019

Appendix F: Reflective Practice Questionnaire

1. What did you bring in today? (Personal, practice?)
2. What did we make or develop?
3. How did you do it, i.e. what were the tools you used?
4. Any conceptual development?
5. How did you further the process?
6. Any setbacks or blocks?
7. Inspiration in the studio?

Appendix G: AI Usage Disclosure

This thesis has used Generative AI (Anthropic- Claude: Models: Sonnet 3.5 and 4.5 and Opus 4.5) as a high-level editor. Usage corresponds to Level 3 in the Traffic Light Model, as adapted by the University of Limerick, legitimated by TCD Centre for Academic Practice, Trinity Teaching and Learning,⁴⁷¹ and supported by my supervisor, acting on behalf of the School of Creative Arts. In the interest of transparency and academic integrity, I have outlined the GenAI workflow used during the writing of this thesis and included a list of most used prompts. Note however that GenAI was not a feature of any part of the practice work development across the lifetime of this thesis, nor was it used for research purposes.

Step 1: Practice reflection, research, idea mapping.

Step 2: Draft writing.

Step 3: Draft sharpening – Claude introduced to the workflow.

- Prompt 1: please assess this (sentence/paragraph/section) for clarity, structure, coherence, and rigour.
- Prompt 2: please suggest a synonym for X
- Prompt 3: please highlight areas of repetition/areas in need of a bridging sentence
- Prompt 4: please assess for continuity of tone across this section/chapter
- Prompt 5: please advise on the structure/length of this section

Step 4: Draft edits.

⁴⁷¹ Trinity College Dublin, 'GenAI and Assessment - Centre for Academic Practice, Trinity Teaching & Learning | Trinity College Dublin', accessed 16 February 2026, <https://www.tcd.ie/academicpractice/resources/gen-ai-hub/genai-and-assessment/>.