

XR Marks the Spot:
Augmenting Spatial Histories of Coloniality
Through Immersive Technologies

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Abstract

This integrated thesis examines how immersive technologies may be operationalised to critically contextualise spatial enactments of colonial histories. Beginning with a literature review of the intersections between immersive technologies (XR) research, spatial studies, decolonial theory and critical historiography, this work encompasses four integrated papers which each focus on a separate aspect of XR in the context of spatial Coloniality. Three of the papers are paired with prototype studies based on sites in Oxford, UK. This thesis employs a research-through-XR approach which utilises conceptual taxonomies, research-through-design, case studies and prototyping. Together, the chapters of this thesis produce the following workflow: positioning a locality in space (*The Blue-Tooth Spectrum*), conducting a structured spatial analysis (*Facets of Space*), creating experimental content (*Rhodes Not Taken*), and connecting virtual interactions with material impact (*Breaking the [Virtual] Chains*). *The Blue-Tooth Spectrum* proposes a conceptual taxonomy for positioning localities in digitally suffused, ‘hybrid’ spaces which moves beyond a semantic and ontological separation of ‘reality’ and ‘virtuality’. *Facets of Space* develops a conceptual taxonomy which facets spatial (meta)data into nine dimensions. *Rhodes Not Taken* examines how spatial histories may be re-narrated to make the subtle dimensions of Coloniality accessible to lay audiences. *Breaking the (Virtual) Chains* examines the interplay of gamification, awareness, empathy, and monetisation in XR applications to better understand this technology’s potential and limitations for social justice activism. The thesis’ Discussion brings together these chapters’ contributions to probe the liminal spaces where academia and activism form a productive tension. Exploring the notion of *critical vandalisms*, this work offers a meta-reflection on the intersections of decolonial theory, spatial justice, and personal positioning. Aimed at HCI researchers, XR researchers and practitioners, historians, and decolonial activists, this thesis advocates for XR as an experiential medium of translation which can facilitate nuanced engagements with the subtle dimensions of Coloniality embedded in our shared environments.

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‘I saw my life branching out before me like the green fig tree in the story. From the tip of every branch, like a fat purple fig, a wonderful future beckoned and winked. One fig was a husband and a happy home and children, and another fig was a famous poet and another fig was a brilliant professor, and another fig was Ee Gee, the amazing editor, and another fig was Europe and Africa and South America, and another fig was Constantin and Socrates and Attila and a pack of other lovers with queer names and offbeat professions, and another fig was an Olympic lady crew champion, and beyond and above these figs were many more figs I couldn’t quite make out (...) I wanted each and every one of them, but choosing one meant losing all the rest, and, as I sat there, unable to decide, the figs began to wrinkle and go black, and, one by one, they plopped to the ground at my feet.’

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Note on Images

All images in this thesis were created by me, unless otherwise credited. Illustrations which serve to communicate information have annotations, whereas those which are merely decorative do not. All illustrations in this thesis were drawn by me.

No Statues Were Harmed in the Writing of This Introduction



As a response to the Black Lives Matter (BLM) protests in 2020, the British government commissioned a report which exemplifies the climate of increasing political polarisation in which decolonial issues are discussed. This report, authored by the Commission on Race and Ethnic Disparities (Sewell et al., 2020), states that ‘evidence shows that geography, family influence, socio-economic background, culture, and religion have more significant impact on life chances’ than racism (p. 16), implying that the latter can be separated from the former. Its argument against ‘negative calls for “decolonising” the curriculum’ equates decolonising with ‘the banning of White authors’, ‘token expressions of Black achievement’, and ‘bringing down statues’ (p. 17). This rhetoric, labelled ‘poisonously patronising’ and ‘historically illiterate’ by historian David Olusoga (2021), draws attention to two aspects which dominate public discourse on decolonial issues in Britain.

Firstly, it replicates a favouring of ‘nostalgia and amnesia’ (Goodfellow, 2019), in which ‘the very history which made Britain “Great” is disavowed, externalised, and projected onto its (European) enemies – portraying itself as the victim rather than the perpetrator of imperial violence’ (Koram, 2017). According to Paul Gilroy, this nostalgia articulates ‘the formative experience of empire as less profound and less potent in shaping the life of the colonising powers than it actually was’ (Gilroy, 2004), effectively denying the persistence of colonial ideologies in education, law, and politics which proliferate systemic inequalities. Even though the events of 2020 made these inequalities harder to ignore, the ‘pervasive presence’ (Nabulsi, 2017) of colonial power paradigms in Britain and its territories complicates a critical engagement with its past. In comparison to its European neighbours, Britain seems to struggle particularly hard against the ‘unbearable searchlight of complicity’ (Tuck & Yang, 2012) which calls its Imperial glory into question (Gildea, 2019). Or at least it does so at an institutional and governmental level. If the protests of 2020 were any indication, plenty of people who live in Britain seek to reshape the material environments we co-inhabit to reflect an ideological shift towards anti-racism and equality.

This is not how this governmental report presents decolonial activism (Sewell et al., 2020), however. Instead, it describes decolonial efforts as inherently negative and divisive, as counterfactual, potentially violent, and profoundly threatening, which is the second popular maxim the report replicates. The mass potential of this sentiment was prominently evidenced by the 2020 backlash against the National Trust's rigorous investigation into its own properties' ties to slavery (Bailey et al., 2020). Despite the factual evidence presented in their report and its proclaimed aim for acknowledgement, not demolition, the National Trust's efforts were publicly reprimanded for endangering and 'politicising' British heritage (G. K. Adams, 2020). The underlying assumption of this accusation is that heritage is not inherently political to begin with, a claim widely disputed by historians, critical geographers, sociologists, and political scientists who focus on the interdisciplinary field of Spatial Studies (Drayton, 2019; Gildea, 2019; S. Hall, 1999; Stemplowska, 2021). This disconnect exemplifies the common conflation of colonialism, Modern colonialism, and Coloniality.

While colonialism, an 'invasion and foreign occupation' which features the deliberate erasure of cultures (de Sousa Santos, 2016, p. 81), has been occurred across civilisations throughout history, Modern colonialism is distinct as being intrinsically intertwined with global capitalism, chattel slavery, and the racist ideologies which were used to justify it (Dussel, 1993; Gildea, 2019; Lugones, 2010; Mignolo, 2002, 2011; de Sousa Santos, 2016). Modern colonialism was 'a system of naturalising differences in such a way that the hierarchies that justify domination, oppression, and so on are considered the product of the inferiority of certain peoples and not the cause of their so-called inferiority' (de Sousa Santos, 2016, p. 82). If Modern colonialism is the 'effect', Coloniality is its 'after-effect': a 'mutation' which 'continues after formal decolonisation' (Lockward, 2019b). Enactments of Coloniality include language imperialism, institutionalised racism, and gender hierarchies, but also our built environments (Jacob, 2012). From the media imagery we are surrounded by to the architectures we inhabit and the very words with which we formulate our thoughts, Coloniality is hard to scope, contextualise, and eventually challenge without a wealth of information. Thus, there is a growing need for tools which allow for public engagement with factual information on the environments which we inhabit, and the ideologies we are engulfed in. However, the backlash against of the National Trust report is just one of many discouraging instances of wilful ignorance in Britain: if even national heritage institutions cannot openly acknowledge and criticise the legacies of colonialism, how do public spaces with no central cultural governance stand a chance?

The approach this thesis takes is to operationalise immersive technologies for this purpose. Immersive technologies, or Extended Reality (XR), is an umbrella term which encompasses several interactive, spatial technologies. This includes Virtual Reality (VR), commonly understood as a virtual space which alters perceptive experiences across multiple sensory modalities (audio-visual, haptic, somatosensory, etc.) whilst entirely obscuring the material environment (Lanier, 2017); Augmented Reality (AR), which overlays material environments with a digital layer of information (Furht, 2011) to create a virtual-material co-presence; Mixed Reality (MR), which denotes a seamless blending of virtual and material elements (Benford & Giannachi, 2011); holograms, movement-responsive video-mapping, and some forms of video projection. This thesis predominantly focuses on AR applications but draws on broader XR literature. I argue that as a spatial medium which is widely accessible in Britain, XR technologies are particularly suitable to critically engage with our shared *ideoscapes*, a term Arjun Appadurai (1990) uses to describe the varied manifestations of ideologies in material environments, educational systems, legislature, media representation, and public spheres.

The presented research proposes strategies for creating dialogical XR tools which critically contextualise spatial enactments of colonial ideologies. The premise is that in the absence of material change through governmental or institutional intervention, XR technologies can be harnessed to mediate interventions which affect attitudes, imaginaries, and eventually, built spaces. While this form of impact is too long-term and intangible to be scoped within a thesis, the strategies proposed in this work follow this aspirational trajectory. Its other two foci are experience-centric XR creation and thorough engagement with decolonial thought. Throughout this thesis, I therefore refer to users, co-creators, and interactors of XR encounters as *experiencers* to step away from the connotations of the word ‘user’ in other media studies contexts, but also to underline the spatial experience of XR interactions.

I predominantly use the term ‘decolonial’ to describe ‘analytic and practical options confronting and delinking from (...) the colonial matrix of power’ (Mignolo, 2002, p. 52), which is a definition other writers might apply to ‘postcolonial’ or ‘anticolonial’ approaches. Each of these terms is commonly historicised as stemming from different schools of scholarship¹ and geopolitical origins² (Bhambra, 2014). My choosing ‘decolonial’ does not reflect a political alignment with one school over another, but is based on the terminological connotations of the word and its usage in activism contexts. *Postcoloniality*, linguistically inferring a temporal divide between the present and the colonial, perpetuates a conceptualisation of colonial violence as a predominantly historical issue. While this interpretation does not reflect the diverse landscape of postcolonial practice and scholarship, *decoloniality* offers a semantic focus on proactive engagement. As Madina Tlostanova (2019) argues, the *postcolonial* may be considered a condition, ‘a geopolitical and geohistorical situation’, whereas the *decolonial* is an ‘option, consciously chosen as a political, ethical, and epistemic positionality and an entry point into agency’ (p. 14).

This action-based approach has been absorbed into the rhetoric of numerous political movements and groups which are relevant to my research. The *Rhodes Must Fall* movements in South Africa and Oxford (Chantiluke et al., 2018), for instance, do not call to ‘postcolonise’ academia, although their geo-political positioning is tied more closely to ‘postcolonial’ academic spaces than ‘decolonial’ ones. Moreover, ‘decolonial’ is the preferred term used by Indigenous and First Nation authors, as ‘there is nothing “former” or “post” about the colonialism that they write about: they are writing out of and about the continuous colonisation and re-(or neo-)colonisation of the countries where their ancestors have always lived’ (Noxolo, 2017, p. 27). Accordingly, postcolonial theory presents a ‘historically oriented analysis of how colonial norms were established and continue into the present’ (ibid.) whereas decolonial theorising ‘is focused on an epistemic challenge to colonialist thinking, with an emphasis on radical delinking from the sources of ongoing inequalities’ (ibid.). While my research includes the former, it foregrounds the latter.

Focusing on XR is both a pragmatic decision based on the growing integration of immersive functions into mass media, and a choice of medium which aligns with the epistemological underpinnings of this work. From Zoom face filters and virtual classrooms during lockdown, the adaptation of interactive TikTok filters into other social media platforms, a booming XR gaming market (Hilmersson & Lindström, 2023; Johannesson & Karlsson, 2023; Shukla, 2020) and high-end fashion labels selling Virtual Reality (VR) versions of their products (Jung et

¹ Postcolonial scholarship derives from Literary Studies, decolonial scholarship from the Social Sciences.

² South-East Asia and Central/South America, respectively.

al., 2021), to David Attenborough appearing, fully 3D-scanned, in an Augmented Reality (AR) exhibition: public engagement with XR interactions is becoming increasingly prevalent. Envisioning digital culture in ten years' time, the image is relatively clear: major investments (O'Hara, 2024), focus areas of Big Tech (Muehl, 2024), research innovations (Aupperlee, 2023), mass market novelties (Jiang, 2024), and consumer trends (Rajan, 2023) are all pointing into the same direction. The Spatial Web – an embodied, interactive integration of digital data into material spaces – is the logical Web 4.0. It is the next step towards tailoring content to specific interests and needs (Di Blasio et al., 2023; Simon-Liedtke & Baraas, 2022; Vasilchenko et al., 2020), as well as mitigating long-standing accessibility issues (Bauer et al., 2023; Y. Chen et al., 2022; Dutt et al., 2022; Goharinejad et al., 2022; Guarese et al., 2023; Kaplan-Rakowski et al., 2022; López-Ojeda & Hurley, 2021; Lukava et al., 2022; Miller et al., 2023; Miró-Mediano et al., 2023; Moustafa et al., 2023; Pong & Wah, 2019; Pons et al., 2022).

Increased customisability is already strongly evidenced in current digital trends and will likely move from being a luxury to being the norm (Boudet, 2024). Simultaneously, the advent of mass-market 3D printing is beginning to change the relationship of audiences and curators of material culture (Kantaros et al., 2023; Kumar et al., 2022), and in combination with broader trends towards user-generated content in various digital spheres, there is both emancipatory potential and an increased risk of exploitation embedded in these developments (Bjork-James, 2021). This risk, along with the ubiquitous presence of Coloniality, is a central justification for the use of XR technologies in this thesis. Being constantly engulfed in a system which reproduces colonial valorisation patterns means that for most people, imagining anything outside of this referential framework is profoundly challenging. Immersive technologies which overlay material spaces with digital information (AR/MR) make this task significantly easier. By providing imagery and annotations to material spaces, AR-generated content provides users with a visual scaffolding upon which they can build their own interpretations and critical reflections, rather than being preoccupied with trying to unthink their entire framework of reference (Chang et al., 2015; Harley et al., 2016). However, this approach comes with a myriad of challenges, from the embeddedness of immersive technologies in Western-centric knowledge networks to the shifting hierarchies of content creation and editing. Additionally, XR research is currently scattered across several disciplines which do not readily communicate with one another, leading to a lack of transferable metadata (Rahaman et al., 2019) and knowledge exchange.

This thesis addresses these challenges through four integrated papers which each contribute one part of a strategic toolkit for XR researchers, historians, designers, activists, and communities involved in decolonial efforts. It takes a 'research-through-XR' approach which adapts principles from research-through-design (P. Dalsgaard, 2016; Gaver, 2012; Godin & Zahedi, 2014, 2014) to develop conceptual contributions and experimental XR prototypes in dialogue with one another. By leveraging conceptual taxonomies, case studies, and prototype studies, this thesis seeks to examine *how immersive technologies can be operationalised to critically contextualise spatial enactments of Coloniality* (Motivating Research Question). It asks how immersive technologies may enable us to relate differently to our collective pasts, change how we narrate our own histories through the spaces we inhabit, acknowledge who is represented and not represented in these spaces, and how this contributes to collective knowledge production and value structures. Practically, it asks how we can challenge some of these spatial preconceptions through immersive technologies and which processes of data management, content production, and interaction design may contribute to this.

Chapter 1 reviews the contextual literature within which this thesis' work is embedded. While it pays detailed attention to varying notions of space, those familiar with this discourse may note an absence of discussions surrounding 'place'. I work with Tim Cresswell's (2011) definition of place as 'a meaningful site that combines location, locale, and sense of place' (p. 1). I also repeatedly use the term 'locality' throughout this thesis to describe a nameable site which a person orients themselves towards (Casey, 2009) in hybrid space. Contextualising my research in both Spatial Studies and decolonial theory is important to the interdisciplinary ethos of this work: different aspects of it speak to various disciplines, but these two components underpin my work as a whole.

Chapter 2 provides an overview of my research questions, while Chapter 3 outlines the methodological approach of this thesis, and describes the site selection for its analyses. It introduces the experimental Research-through-XR approach, combining conceptual taxonomies, case studies, Research-through-Design, and prototype studies, and provides an overview of the methods detailed in each subsequent chapter.

Chapter 4 contains the first integrated paper, *The Blue Tooth Spectrum*, which investigates shared understandings of reality/virtuality binaries. It discusses the increasing hybridity of contemporary spaces, which necessitates new conceptualisations for positioning localities in hybrid space.

RQ1: What are the gaps in existing conceptual XR taxonomies and how can we improve them to better position localities in space?

RQ1.1: How can the limitations of Milgram and Kishino's RV Continuum be addressed to better reflect the contemporary realities of hybrid spaces?

RQ1.2: What framework can be used to position localities in hybrid spaces in a way which centres the experiencer rather than the technology?

By conducting a critical discourse analysis focused on Milgram and Kishino's (1995) seminal *Reality-Virtuality Continuum*, this paper reflects on thirty years of HCI (Human-Computer Interaction) scholarship engaging with changing notions of the 'real' and the 'virtual'. It stipulates that in the hybrid present, distinguishing between the two no longer serves the advancement of XR scholarship, but rather confines it in boxes which were made before its inception. This integrated paper proposes an original conceptual taxonomy with eleven axes which seek to capture how a multiplicity of experiences and modes of acting relate to one another in hybrid space. This is intended as a first step of orientation for developing a shared language for present and future spatial constellations: to describe a space, articulate what it does, and trace how it relates to other spatial experiences. While making a practical contribution to XR scholarship, *The Blue Tooth Spectrum* also asks fundamental questions about spatial contestation. In hybrid space, where do we draw the lines of what is considered 'real', and how does this map onto histories of oppression in which the most disenfranchised members of society are continuously not believed, listened to, or given space?

Chapter 5, *Facets of Space*, which consists of the second integrated paper and a prototype study, addresses this issue from a different angle: it asks, in a scenario where inclusive spatial co-production is a key objective, how spatial data and metadata can be organised to facilitate polyvocality, transparency, and transferability.

RQ2: How can spatial (meta)data be organised in a structured, transferable, and transparent way to support the interdisciplinary exchange of data in XR interactions?

Facets of Space highlights the power which data wields over hybrid spaces, and argues that through inclusive spatial data management systems, this power can be harnessed by communities, researchers, and XR practitioners. It proposes a conceptual taxonomy which is designed to prevent data redundancies, increase transparency, and foster communication between projects. Through nine spatial strata, it allows for both professional and lay adaptation of the taxonomy as a spatial analysis tool, research database, and collaborative space across teams and projects. It uses the former Indian Institute in Oxford, UK, as its central case study.

Chapter 6, *Rhodes Not Taken*, builds on the participatory ethos of the first two papers' taxonomies. The third integrated paper and its accompanying prototype study investigate the potential of experimental historiographical methods as a form of critical content creation. Virtual histories, or speculative histories, extrapolate a timeline in which certain historical events did not happen (or had a different outcome) in order to accentuate the decisions which were, in fact, made (Bradley & Cowley, 2001). They conjecture on 'what did not happen, or what might have happened, in order to understand what did happen' (Black & MacRaild, 1997, p. 127). *Rhodes Not Taken* utilises this approach to question how we collectively narrate the histories embedded in our built environments.

RQ3: How can spatial histories be re-narrated to make transparent the effects of Coloniality?

RQ 3.1: How can alternative historical frameworks, such as virtual histories, help us critically engage with spatial Coloniality?

RQ 3.2: How can virtual histories be translated into XR to support critical engagement with spatial Coloniality?

The first part of this chapter examines the issues inherent to monolithic ways of narrating shared histories and draws lines between past injustices and present forms of structural oppression. It employs a virtual history case study of the Cecil J. Rhodes statue in Oxford, UK, to demonstrate these connections. The second part, an experimental XR prototype, builds on this analysis.

Following this line of inquiry – establishing what a space does, how it can be analysed and annotated, and engaging with its embedded histories – provides an answer to how immersive technologies can be operationalised to critically contextualise spatial enactments of Coloniality. However, it does not engage with the potential risks and repercussions of such engagements. These are the challenges which Chapter 7 addresses.

Chapter 7, *Breaking the (Virtual) Chains*, consists of the fourth integrated paper and a prototype study, *Steal It Back*, which address the liminal spaces of social justice activism from different angles.

RQ4: How can XR-facilitated activism support material change?

RQ 4.1: What factors shape the relationship between virtual interactions and material social justice outcomes?

RQ 4.2: What strategies can support the creation of activist XR interactions to facilitate material social justice change?

Breaking the (Virtual) Chains discusses the tech-scepticism which accompanies XR-oriented solutions and proposes Poka Laenui's (2006) *Processes of Decolonisation* as a scaffolding to describe actionable steps between awareness and material change in activist settings. This builds a practice-oriented counterpart to the *Blue Tooth Spectrum*'s semantic blurring of perceived boundaries between material and virtual spaces. It utilises the notions of spectral fluidity which this thesis is built on in order to demonstrate how XR activism can support material social justice impacts. *Steal It Back*, the chapter's prototype, makes a complementary contribution based on a

research-through-design process centring on restitution discourse. The prototype study's site is a Haida helmet situated at the Pitt Rivers Museum, Oxford.

Chapter 8 brings the previous chapters' respective outputs into dialogue with one another to reflect on the interplay of responsibility, opportunity, and risk when utilising immersive technologies in decolonial contexts. Emerging technologies hold the risk of reproducing existing power dynamics (Strate, 2012), but they also promise disruption, if applied conscientiously (Appadurai, 1990). In the absence of governmental initiatives to decolonise public spaces or educational curricula, and in the face of a media discourse which presents nuanced issues in an increasingly binary way, XR presents an avenue of decolonial resistance. This thesis advocates for a close connection between academic critique and decolonial social justice activism through experimental XR interactions. As a means of spatial contestation, XR experiences can, at the very least, support a climate of social change, and ideally, have material impact on our shared environments.

My work seeks to engage with this emerging discourse by exploring spatial Coloniality through immersive technologies in ways which are respectful of multiple ways of knowing and learning. It continuously asks who is being represented in our shared environments and histories, and how XR can contribute to a version of spatial production which is more inclusive, representative, and polyvocal. The research presented in this thesis aims to emphasise that decolonial approaches to XR interactions have the potential to go beyond academic discourse and actively reshape the hybrid environments which we collectively inhabit. Through its interdisciplinary framework, this work offers an expandable toolkit for scholars, activists, and communities to engage in meaningful dialogue, promote inclusive histories, and challenge the power dynamics embedded in our shared environments. It argues that immersive technologies, if leveraged thoughtfully, can influence both individual perceptions and broader societal transformations, thereby providing a potent avenue for decolonial praxis.

By operationalising XR to examine the intersections of Coloniality, representation, and power, this thesis proposes conceptual and practical strategies for critical reflection and intervention which go beyond metaphorical engagements with decolonial thought. Through an experimental Research-through-XR approach, it seeks to produce decolonial Critical Vandalisms – forms of virtual critique which facilitate long-term material change. First and foremost, however, it encourages you, dear Reader, to ask the questions it may miss, to explore the avenues beyond its scope, and to imagine how its experimental approaches could be spun into different fabrics of space, in different places, times, and technologies.

Positionality Statement

My socio-cultural background is engrained in the often-contradictory considerations of intergenerational responsibility which have informed my work. Being a White European raised in relative ignorance of the profound impact Coloniality exerts on contemporary life, and my subsequent education on decolonial activism as an adult, initiated my interest in using immersive technologies to facilitate these types of perspectival shifts. While I view my work as accountable to the communities whose marginalisation decolonial activism seeks to challenge, I do not speak or act for any community I am not myself a part of. In the context of my work, questions about who is speaking for whom and about whom, from which perspective, are prevalent at a theoretical as well as a practical level. I refer to the writings of Linda Alcoff (1991), Chandra Mohanty (1984) and Sonia Kruks (2005) in this context, who have outlined the challenges of representation, positioned knowledge, and writing from a privileged perspective, respectively. Their academic contributions have informed my reflection on my role as researcher in this project, but also as co-creator, conversation partner, and co-presence in material and virtual spaces.

This project is, by virtue of its topic, inherently political. I engage with decolonial literature from a perspective of Critical Whiteness (Applebaum, 2016) and try to provide as much transparency about my sources and motivations as possible. I believe White researchers at Western institutions have a responsibility to foster and further critical discussions on Coloniality precisely *because* we are privileged by colonial valorisation systems. In my opinion, it is not the responsibility of those oppressed by these systems to educate those privileged by it. While I aim to contribute to this education – that of myself and others who share my positionality – I am also aware that there is a risk of appropriating decolonial thought and engaging in performative acts of decolonising (Cusicanqui, 2012; Tuck & Yang, 2012). Given that the medium I examine is defined by its virtuality, this risk is especially apparent. Throughout this work, I reflect on these concerns and how they shape my work, as well as my accountability to decolonial activism.

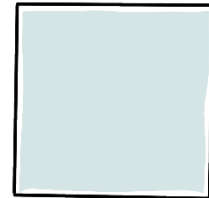


Chapter 1: Literature Review

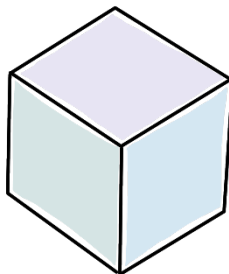
The Box

In *Towards a Redefinition of Indian Education*, Eber Hampton (2007) describes an encounter with an elder who holds out a cardboard box, facing him straight on.

‘How many sides do you see?’, the elder asks, to which Hampton replies: ‘One’.

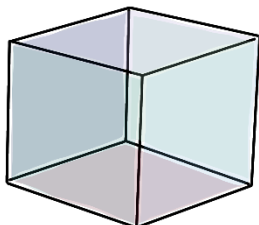


The elder then angles the box differently and asks: ‘Now how many sides do you see?’, to which Hampton responds: ‘Now I see three sides.’



Following this, ‘he stepped back and extended the box, one corner towards him and one towards me.

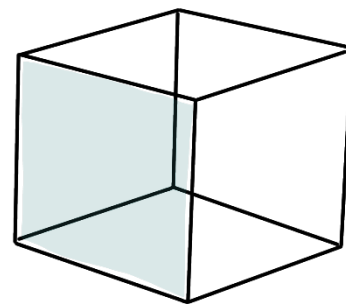
“You and I together can see six sides of this box” (p. 42).



The metaphorical box in which I place the research presented in this thesis has six sides. Each of them is essential for understanding the totality of the contribution this work aims to achieve, and exists as a distinct realm, whilst overlapping with the other sides, creating a constellation of intersections and gaps. Hampton’s anecdote beautifully illustrates that even my best attempt at contextualising key aspects of my research can only cover the sides which I can see. You, as a reader, may see other sides to this work, and make different connections across the interdisciplinary planes it engages with. Together, we may be able to see twelve sides of this box or realise

that some sides fold into one another in Escher-esque fashion, creating new spaces and multiplicities within them. Since I delight at this possibility, the following six sides are intended as corner points, not definitive planes which my research neatly fits into. I hope they can guide an understanding of my path through this research, and place my papers and case studies within the critical context they emerged from. This box is designed to create a foundational frame upon which the more specific literature reviews of my individual papers can lean. Rather than imagining these as smaller boxes contained within this box, I view them as fractals of the following sides, breaking into prisms of perspectives and applications. They are not equal in size or weight, and their significance will vary depending on the viewpoint from which you are looking at them.

Since this work engages with spatial histories, a spatial technology, and critical considerations on how we collectively shape shared spaces, I will begin with positioning this work in the context of Spatial Studies, outlining the key concepts on which this thesis was built.



Side I: Spaces

This section introduces the notions of space with which this thesis works, focusing on relational understandings of space. It positions material and digital architecture as enactments of societal ideologies and frames productions of space as a multi-model collective practice in hybrid spaces.

Hybridity is a constitutive component of our present reality: material and digital spheres are becoming increasingly entangled, shifting how we collectively produce and shape our environments, and how they, in turn, shape us. A key argument this thesis builds on is that with increasing spatial hybridity, digital means of societal intervention gain power (Burkholder et al., 2015; Calder & Otrell-Cass, 2021; Featherstone & Lash, 1999; M. Lim, 2014; Mosco, 2005; Tabassum et al., 2023). However, to wield this power responsibly, we need to better understand how spatial production operates in hybrid spaces, from metadata management systems to material impact. This thesis aims to tackle some of these challenges. To position its approach in the contextual literature, three areas of spatial inquiry as essential: relational notions of spatial production, decolonial perspectives on space, and the intersection of immersive technologies and spatial production.

Relational Space

Henri Lefebvre (1974), widely credited with terming the *production of space* through his 1974 book of the same name, interprets environments as communally constructed and, in the context of modern urban spaces, as

manifestations of capitalist oppression. Lefebvre states that ‘things matter little; the thing is only a metaphor, divulged by discourse, divulging representations that conceal the production of repetitive time and space’ (p. 7). However, the lived consequences which result from people’s interactions with ‘things’, do matter: while transfers of intergenerational value systems happen at representational level, these ‘metaphors’ result in oppression, exclusion, and discrimination which are not merely metaphorical. As Eve Tuck and K. Wayne Yang (2012) express, dismissing these lived experiences in favour of discursive considerations displays a complicity with established power dynamics which is designed to uphold current power distributions. This is essential when considering the utilisation of immersive technologies to alter spatial production: there is potential for more inclusivity, polyvocality, and nuance, but there is also a significant risk of unquestioningly reproducing existing hierarchies of power.

David Harvey (2009a) refers to this dynamic as a ‘relational’ notion of space in which cultural change may produce new spatial configurations, just as spatial changes may result in cultural shifts. Harvey argues that ‘human conceptions of space and time depend not only on individual experience, but also on imagination and culturally derived representations of space’ (Sheppard, 2006, p. 122). This aligns with Martina Löw’s (2008) notion of a ‘duality of space’ which acknowledges the paradoxical position of space as both constituting and shaping action. Löw distinguishes between ‘spacing’ and ‘synthesis’ to describe the difference between the interactions of material and imagined spaces. Edward Soja (2010) structured these distinctions into *Firstspace* (material), *Secondspace* (conceptual), and *Thirdspace* (lived), echoing Karl Popper’s (1968) Three World concept. For the purposes of this thesis, however, it is less relevant to categorise *which* realm a spatial consideration fits into, and more relevant to recognise the complex interconnections *between these realms*. While a relational understanding of space forms the foundation of the considerations articulated throughout this thesis, its orientation is determined by decolonial critique, which serves as a multi-axial reflection point throughout.

Spatial Coloniality

Boaventura de Sousa Santos’ (2016) assessment that ‘we need other knowledges, we need other conceptions of time, we need other conceptions of productivity, we need other conceptions of spatial scale’ (p. 22) encapsulates that the decolonial project is inherently tied into redefining Eurocentric notions of space. Eurocentrism privileges White, predominantly cis-male, heteronormative, Western perspectives in the tradition of Enlightenment scholarship (Dussel, 1993). ‘Other knowledges’ and ‘other conceptions of time’, ‘productivity’, and ‘spatial scale’ depart from this dominant world-view. Emerging from a separation of Western understandings of spatial relations and persisting colonial power paradigms, decolonial scholarship and activism have sought to conceptualise space in terms of power relations which permeate and transcend arbitrary nation-state borders. Technology plays a crucial role in liquifying these perceived barriers between territorial and metaphorical demarcations between people, places, and cultures (Chouliaraki & Georgiou, 2019). Immersive technologies, in particular, offer a translational bridge between material and virtual realms of spatial production. Before I delve into this potential, however, there are a few aspects of decolonial critical engagements with productions of space which are essential to this thesis.

Firstly, colonialism and Coloniality – colonialism’s ‘present reverberations’ (Lockward, 2019b) – are essentially spatial through both the ‘cycles of conquest’ (Spicer & Fontana, 1962, p. 196) which brought them into being, and the ‘geopolitics of knowledge’ which are organised around ‘colonial’ and ‘imperial differences’

(Mignolo, 2002, p. 59). A key premise of decolonial discourse is that the colonial difference is not a by-product, but a constitutive part of Modernity (Dussel, 1993; Lugones, 2010; Mendieta, 2020; Mignolo, 2002; Quijano & Ennis, 2000; Wallerstein, 2004). Across various in-depth explorations of this argument in diverse fields and through numerous lenses, three parallels emerge: Coloniality is presented as essentially spatial; spatial production is embedded in *sociocultural processes* (Bourdieu & Nice, 2013; Lamont et al., 2014; Levinson, 1996); and spatial Coloniality is inherently linked to how we collectively narrate our shared histories and heritage.

The expansive nature of Modern colonialism can easily be accepted as an essentially spatial project, whereas the ‘cognitive imperialism’ (Stewart-Harawira, 2013, p. 40) of Coloniality is less easy to trace. Immanuel Wallerstein attempts to distinguish between ‘two interrelated, although distinct, paradigms’ (Mignolo, 2002, p. 60) of Modernity and the Modern World-System. Accordingly, the former has its roots in Ancient Greece, as the origin story of Eurocentric Modernity, and the latter emerged with Modern colonialism, and is therefore intrinsically linked to capitalism. This distinction is relevant when considering the contemporary repercussions of Coloniality, as well as Tuck and Yang’s (2012) warning that material realities should not be sidelined in favour of metaphorical change. There is a dimension of Coloniality which is a contingent of Modernity, and this dimension is directly linked to a ‘genealogy of subjugated knowledges’ (Stewart-Harawira, 2013, p. 40).

An example which engages with this form of Coloniality is Enrique Dussel’s dissembling of a linear history of Modern Europe as originating in Ancient Greece and leading to the Enlightenment. Dussel (1993) demonstrates that this linear arrangement of an origin story is an invention of Northern European Enlightenment philosophers, not a historical or geographical fact (see Figure 1). Accordingly, Ancient Greek culture was much more closely related to Arab and Sephardic civilisations than the tribes from which central European nations originated. Regardless, this narrative has been used to position ‘European’ culture as ‘the beginning and the end of history’ (Dussel, 1993, p. 69), the centre to which the rest of the world forms a periphery (de Sousa Santos, 2016). This claim to the origins of Modernity means ‘no other people can be said to have any rights proper to it, and certainly none that it could pose *against* Europe’ (Dussel, 1993, p. 73). This perspective is still extremely prevalent in various areas of cultural reproduction, from university syllabi to restitution debates in museums and heritage sites.

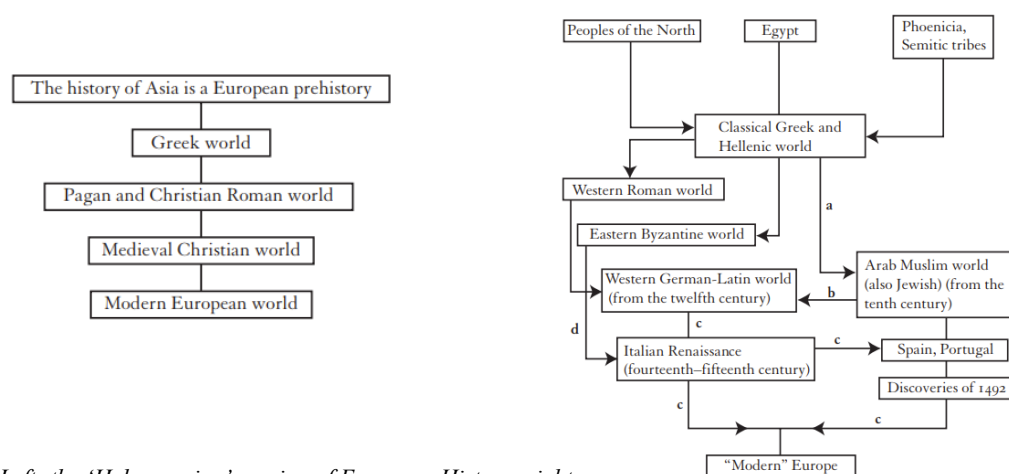


Figure 1. Left: the ‘Habermasian’ version of European History; right: Dussel’s depiction of historical connections between Ancient civilisations and Modern Europe (Image credit: Dussel, 1993, p. 74)

The continuous hegemony of Eurocentrism not only naturalises hierarchies of domination and oppression which are based on the ‘inferiority’ of pre-Modern peoples, it also denies ‘the perspectives of those who have systematically suffered the injustices, dominations, and oppressions caused by colonialism, capitalism, and patriarchy’ (de Sousa Santos, 2016, p. 18). Accordingly, contemporary global structures – legal systems, nation-states, borders, education systems, material culture, etc. – are based on an invented narrative which, over subsequent centuries, manifested one local way of knowing as superior to all others, justifying its violent treatment of other epistemologies, peoples, and cultures. Walter Mignolo (2002) argues that the purpose of making visible these dynamics, and their epistemic potential, is to ‘allow us to imagine’ the ‘alternative futures’ which may exist in the absence of such oppressive structures (p. 76). This thesis argues that immersive technologies can help with this visualisation effort, enabling diverse audiences to engage with the complexities of decolonial discourse. To get to this implementation, however, there are a few points to hold in mind going forward: firstly, that both colonialism and Coloniality are essentially spatial; secondly, that an essential component of colonial value structures is the silencing of diverse perspectives in favour of Eurocentrism; and thirdly, that spatial Coloniality in both its material and metaphorical iterations is closely linked to authority over historical narratives.

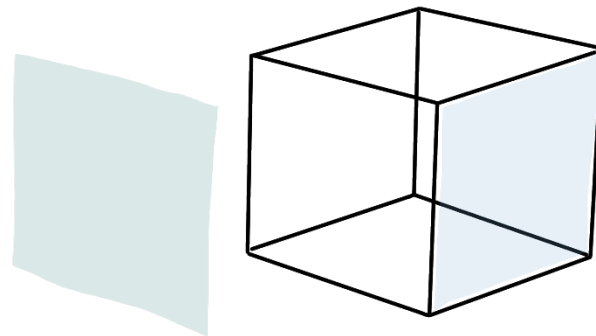
Historicising Spaces

Lefebvre’s (1992) notion of productions of space is mainly concerned with their philosophical nature, with the components of rhythms – measure, frequency, repetition – which simultaneously constitute and shape the relationship of space, time, and energy which construct environments. Decolonial engagements with spatial production are more concerned with the effects these dynamics have on current sociocultural processes, that is the ‘modes of human interaction, negotiation, and production mediated by relations of power’ (L. McCarty, 2014, p. 72). Scholars like Wallerstein (1974, 2004, 2011) and Quijano (2000) examine the ‘macronarratives’ of these dynamics, which span centuries and engage with the underlying structures of oppression, rather than individual events. Robert Bernasconi (1997) and Ramón Grosfoguel (2002), complementarily, investigate the efforts of non-Eurocentric thought to break the chokehold of Western ways of thinking, knowing, and believing. These lenses can be interpreted through Lefebvre’s rhythms, but they simultaneously pose comparable challenges in terms of their spatio-temporal scope and abstraction. For my work, I needed a framing which is accessible for lay audiences who may never have engaged in decolonial discourse, or for researchers and practitioners who are not experts in this field. In this sense, focusing on spatial Coloniality is also a pragmatic choice: by rooting a narrative in one locality, an interaction can cut through the complex layers of colonial power structures.

Mignolo (2011) offers the following description of spatial Coloniality: ‘beneath Iran there is the history of Persia and the Safavid Sultanate; beneath Iraq is the history of the Ottoman Sultanate’ (p. 40). This notion of a spatial layering of histories which co-produces the socio-cultural constellations of our present was highly influential on my thinking throughout this thesis. The idea of using immersive technologies to make historical layers visible and audible came from this conceptual underpinning as much as from art-historical practices of analytically peeling back the layers of an oil painting to better understand the process of its production. Spatial production is more rhizomatic than an oil painting, but a key claim of this thesis is that immersive technologies can offer modes for understanding its layers and processes better. Robin George Collingwood (2005) describes ‘our habit of spatialising time’ as ‘an attempt to understand the present by reconstructing its determining conditions’ (p. 364). In examining how colonial value structures came to constitute our present, decolonial

scholars frequently resort to excavating the deep past, but they also investigate contemporary practices and structures.

When Paul Gilroy (1993) argues against a static definition of culture, for instance, he touches on three aspects of localness which author Taye Selasi (2014) describes as *rituals*, *relationships*, and *restrictions*. Accordingly, spatial belonging is not purely shaped by territorial borders, but manifests through quotidian practices. Selasi proposes that through *rituals* (e.g. which food one cooks and eats), interpersonal *relationships* (incl. digitally mediated connections), and mobility *restrictions* (e.g. which passport one has), people's sense of where they are *local* is shaped. These three factors, in turn, are shaped by digital technologies, directly interlinking material and digital senses of place, belonging, and locality. These two examples – the layering of history which Mignolo describes, and the three 'R's of localness – form two conceptual building blocks of this thesis: on the one hand, an unravelling of historical and contextual layers which link a locality to larger societal currents; on the other hand, the everyday practices which determine how the impact of spatial Coloniality manifests. Both of these perspectives are applied to *hybrid spaces* – environments which are in constant flux, co-constituted by material and immaterial factors. The following section will discuss how digital technologies, and XR in particular, co-constitute these hybrid spaces.



Side II: Realities

This section discusses interdisciplinary notions of a reality/virtuality binary, which this thesis seeks to undermine. Instead, it suggests a notion of reality which includes different echelons of hybrid space.

When considering materiality, the following question posed by popular physicist Carlo Rovelli appears to be a conceptual response to Lefebvre's stance that 'things matter little':

'If the world were, however, made of things, what would these things be? The atoms, which we have discovered to be made up in turn of smaller particles? The elementary particles, which, as we have discovered, are nothing other than the ephemeral agitations of a field? The quantum fields, which we have found to be little more than codes of a language with which to speak of interactions and events?' (p. 88).

The underlying provocation of this question is to consider the scale at which we define what does and does not count as part of us, our environments, or reality. While this may sound like a philosophical question, in the context of immersive technologies, it has practical implications. The first paper of this thesis examines Kishino and Milgram's (1995) seminal *Reality-Virtuality Continuum* and proposes an alternative taxonomy to better reflect

contemporary uses of XR spaces. Within this taxonomy, there are several axes which represent spectra of material presence which complicate binary notions of space. This is a form of hybridity inherent to contemporary spaces, whether they are mediated through digital technologies or not (Graham, 2013).

Architectural theorist Sam Jacob (2012) conceptualises human-built environments as enactments of ideologies and describes the construction of architecture as a form of ‘real fiction’ (p. 10). Accordingly, social spaces are part of collective identity building and maintenance in which a ‘partial and fictionalised narrative’ of history (p. 12) constantly re-stages itself, legitimising ‘its new propositions by embedding them within lineages of existing languages, materials, and typologies’ (p.13). As Doreen Massey (2005) argues, space is ‘always under construction’ (p. 32), and that construction is neither accidental nor neutral. It is essential to acknowledge the political and ideological nature of these constructions, whilst also recognising that any form of spatial alteration is a form of re-narration.

Historically, this is materially apparent in the aftermath of significant political shifts, from the tearing down of statues to the renaming of streets (Gill & Hunter, 2021; Lipkin, 2000). In critical discourse, these re-narrations have been examined to highlight the intersections of space with specific lines of exclusion, such as gender, race, or socio-economic class (Lugones, 2003; Massey, 1994; Ortega, 2006). These dimensions demonstrate a layering of spatial experience as both engulfed in discourse (Lefebvre, 1974) and co-constituted by technological interventions, creating a new form of hybridity (De Souza E Silva, 2006; Dodge & Kitchin, 2005; Jordan, 2009). Thus, when we consider that architecture performs ‘the economic, social, and political ideologies of the society that creates it’ (Jacob, 2012, p. 32), we must also acknowledge that in the Digital Age, not all forms of architecture are material, and not all spaces easily split into concepts or atoms.

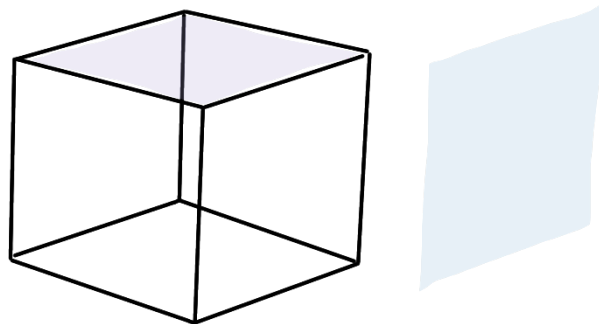
Makere Stewart-Harawira (2013) critiques that ‘even “holistic” western approaches like quantum physics fail to take seriously spiritual and emotional experiences as well as the physical, material, and mental ones’ (p. 44). This is not to dismiss the significant impact material environments have in shaping digital spaces (Aoyama & Sheppard, 2003; Bos, 2021; Graham, 2013), but to acknowledge that even relational, hybrid understandings of space have gaps. It is no coincidence that these gaps take the shape colonial power relations: a favouring of visual components over other senses (Oyěwùmí, 2005), a propagation of Eurocentric world views (Nakamura, 2020), and a systemic stabilisation of colonial value structures (Lugones, 2010; Quijano & Ennis, 2000; Wallerstein, 2011). In positioning the work in this thesis, and the communities it intends to speak to, it is essential to foreground that ‘the world of reality and the world of imagination are sites of struggle for authenticity and authority’ (Battiste, 2007, p. xxii). It is easier to state that established ways of conceptualising hybrid spaces are dismissive of lived experience than to include these perspectives by the standards of Western critique.

Robert Bernasconi (1997) describes this dilemma as a ‘double bind’, which either positions these perspectives as so similar to hegemonic ways of knowing that they ‘make no distinctive contribution’ and effectively disappear, or they are so different that their legitimacy ‘will always be in doubt’ (p. 188). This directly applies to XR interventions to material spaces: they may be absorbed into existing discourse, seemingly making no original contribution, or dismissed as ‘merely virtual’, and therefore lacking material legitimacy. Therefore, discussions of reality/virtuality binaries in relation to immersive technologies is less about material composition, and more about who has the authority to declare something as real or virtual. This has an immediate link to decolonial critiques of Western historiography, which effectively wrote its own centrality into being through a specific

arrangement and linking of facts (Dussel, 1993).

Jean Baudrillard (1995) famously quipped that ‘at a certain speed, the speed of light, you lose even your shadow’ and analogously, ‘at a certain speed, the speed of information, things lose their sense’ (p. 49). In this thesis, I have striven to both keep an eye on my own shadow, and question the sense which underpins the information I cite. Critical engagements with the interplay of reality and virtuality from a conceptual perspective, as canonically demonstrated by Deleuze (2002) and Baudrillard (1995), are not the area of research which this thesis aims to contribute to. Rather, this thesis – Paper I in particular – engages with a ‘sense of reality’ which does not distinguish between material, digital, and virtual spaces, but sits in juxtaposition to a ‘sense of possibility’ (Ferguson, 2011, p. 3). This ties into Mignolo’s (2011) prompt that the point of examining spatial, colonial, and epistemic differences is to recognise their potential and imagine alternative futures. Throughout this thesis, I argue that immersive technologies are a tool which can support these forms of collective imaginations, to debase and fragment ‘the preceding mode of reality’ (Ferguson, 2011, p. 3). An example of applying this framing is *Facets of Space*, which engages with how XR can enable spatial data annotation in ways which reach beyond hegemonic histories, and what is or is not considered ‘real’. While metadata and its management are more technical aspects of how XR can support the conceptual reorganisation of collective spatial production, *Rhodes Not Taken*, in contrast, takes the duality of reality/possibility into the realm of experimental content creation. Both of these interventions rest on the premise that XR offers a multi-faceted range of tools to co-produce shared spaces in diverse ways.

Thus far, I have outlined the notions of space with which this thesis works, and how the multi-disciplinary debate on ‘realities’ factors into this research. The following section will take a step closer towards the literature this thesis aims to contribute to by introducing the interdisciplinary context which paints the Cultural Studies backdrop to my approach.



Side III: Languages

This section introduces the broader discourses this research speaks to, focusing on different ways in which we collectively communicate through, with, and about spatial production.

There are parallels between space routinely being presented as ‘blank, neutral, and straightforwardly mappable’ (Ramone, 2019, p. 964) and the notion of digital technologies as unbiased and democratically accessible (Strate, 2012). Thus, critical framings of immersive technologies, which overlap these two domains, must be particularly wary of tech-solutionist optimism, and recognise their limitations and biases. This echoes

concerns from the early days of Cyberspace: Manuel Castells (2002), for instance, notes that biases of topic, language, and authorship are obscured, rather than made transparent, in digital spaces. As Castells' work is more broadly concerned with the 'network society', he articulates a spatial difference between 'places' and 'flows' (Castells, 1996). This resonates with Arjun Appadurai's (1990) notion of global cultural flows, which outlines five fluid dimensions of cultural 'landscapes': *ethnoscapes*, *technoscapes*, *financescapes*, *mediascapes*, and *ideoscapes*. While these five dimensions are mutually constitutive, *mediascapes*, *technoscapes*, and *ideoscapes* are particularly applicable to my approach to immersive technologies.

Mediascapes describe 'the distribution of the electronic capabilities to produce and disseminate information' as well as 'the images of the world created by these media' (Appadurai, 1990, p. 33). Accordingly, mediascapes mould limitations of access, expression, and reproduction of visual language in both material and immaterial spaces. They constitute the variation and usage of spatial ideologies which Edward Soja (2010) describes as the 'socio-spatial dialectic' (p. 78). Whilst spoken and written language form part of this dialectic, the experiential range of immersive technologies produces a multi-layered dimension of spatial production which does not neatly fit into theoretical frameworks which were constructed before its inception. *Technoscapes*, the production, distribution, and configurations of technologies around the world (Appadurai, 1990), are a useful frame to examine this difference. Focusing on *technoscapes* draws attention to forms of spatial production which are generated by and through technologies.

Dodge and Kitchin (2005; 2014) have scrutinised this virtual-material interplay in depth, differentiating between 'code/space' and 'coded space' to express the domination or incidental presence of code in a space, respectively. Zook and Graham (2007) demonstrate how the presence of code shapes material spaces, and vice versa, through the example of Google Maps. Even though millions of people's spatial experiences, journeys, and senses of spatial identity are shaped by Google Maps (Gentzel & Wimmer, 2024), the code which determines recommendations, presence, and priority within the application is obscure to most users. It is this unawareness of being absorbed into code, and being influenced by it, which bears danger, but which also, in reverse, offers opportunities for emancipatory practices. As Stewart-Harawira (2013) points out, the colonial practices of codifying, quantifying, and tabulating can also be inversed and utilised against the system they uphold. My work builds on this aim, attempting to invert technological approaches which can stabilise oppressive systems to instead challenge them.

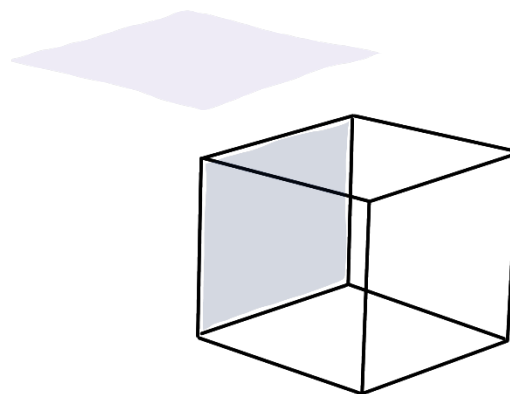
Transparency is a key factor in this objective: code may be more flexible and malleable than built environments, but whether this flexibility can be harnessed for community-benefiting co-production is a question of access and education. Shaw and Graham (2017) note that Google Maps allows 'new informational elites to dominate others in the production of space' (p. 910), which draws parallels to Richard Drayton's (2019) concerns over colonial elites permanently rehearsing 'the violence of domination' (p. 16) through statues in public spaces. William Cohen's (1989) assertion that White elites sought to 'perpetuate their values in the space they dominated' (p. 29) through statues, memorials, and other manifestations of power, connects Drayton's concern to what Appadurai (1990) calls *ideoscapes*: the global flows of ideas, ideologies, and images. Accordingly, the lens of *ideoscapes* can draw a vertical line through the layers of material and virtual architectures which we inhabit, whilst intersecting with *technoscapes* and *mediascapes* horizontally.

This nexus accentuates another key factor, a counterpart to transparency: intentionality. It is essential to

acknowledge that no piece of human-built architecture just happened upon the landscape, whether it is material or virtual. Domination in code/space conveys as much intentionality as the placement, maintenance, and legal protection of material colonial monuments. A question this thesis grapples with is how XR may contribute to this hybrid space in a way which makes intentionality transparent, and fosters transparency more broadly, rather than replicating established lines of obscurity and exclusion.

As a ‘hypermedium’ (Cegys & Weijdom, 2020) which can absorb any other medium, immersive technologies are uniquely positioned to articulate spatial re-narrations because they can present 4-dimensional information 4-dimensionally. Therefore, XR is a medium which may bypass issues raised by Soja (2010) regarding the insufficiency of linear language in relaying spatial information. In current practice, however, XR experiences require 4-dimensional information to go through several 3-or 2-dimensional channels before presenting 4-dimensional information in the end-product. This bears the risk of a misplaced sense of authenticity (Jeffrey et al., 2021), whilst appearing transparent. Thus, language is an aspect I want to draw attention to in relation to code/space and XR, but also at the meta-level of this thesis.

Language suffuses every element thus far discussed: coding is a language, so is architecture, and every discursive contribution cited in this work is constructed through language. As a form of communal, diasporic, and intangible heritage, language permeates Appadurai’s cultural flows as both globally interconnected and locally specific. Doreen Massey refers to this positionality as ‘glocal’ (Massey, 2005). Language is a dimension in which Coloniality, also a ‘glocal’ influence, is traceable at a networked, transcultural scope, and at a local, socio-historically specific scale. Therefore, decolonial scholarship has a long history of topical engagement with the spatiality of language (Bhambra, 2014). Building on this history, this thesis interacts with different dimensions of language – visual languages, code, terminology – in an attempt to contribute to the emerging vocabulary of XR interactions. The following section focuses on the areas of XR scholarship which this thesis aims to contribute to.



Side IV: Windows

This section outlines the XR scholarship to which this thesis aims to contribute, and which aspects of this literature it addresses directly. This includes engaging with the ‘subtlety’ of human environments through XR, developing approaches which foster cross-disciplinary exchange and collaboration across diverse power dynamics in XR creation; and utilising experimental narrative approaches within academic XR research.

Marc Greengrass (in Beacham et al., 2006) describes contemporary efforts in XR heritage visualisations as follows:

‘The historical accounts through which we try to reconstruct [the past] are representations, framed by the window and obscured by the glass through which we try to view it. Both the window and the glass stand in the way of any realistic, let alone objective, picture that we are able to make of it. But the picture is, nevertheless, structured, capable of being understood, and full of meaning. And it is constrained in every pixel by the evidential remains of the past’ (p. 1).

How one contextualises this window and glass depends on how one conceptualises space and XR’s relation to it. Based on the notions of space outlined thus far, XR could be viewed as a form of virtual architecture, performing ‘the economic, social, and political ideologies of the society that creates it’ (Jacob, 2012, p. 32), or as an extension of hybrid modes of interaction which are already part of people’s everyday lives, or both. The window and the glass depend on the type of XR, too: future Mixed Reality (MR) technologies will likely inhabit different points on this interpretative spectrum than current Augmented Reality (AR) applications. A good example of the current standard of AR applications is the popular AR game app *Pokémon Go*, launched in 2016, which fosters interaction with material environments rather than being viewed as *part of* that environment. However, this might easily change with the introduction of AR billboards and other immersive advertising strategies (Lopez-Nores et al., 2015; Naqvi et al., 2024; S. E. Thompson & Richards, 2024). *Google Glasses* were an early attempt at introducing AR into everyday practices and despite their relative lack of commercial success, their conception (as well as the significant success of AR glasses in military use) does suggest that in a near future, smart glasses might be just as commonly used as regular glasses (Smith, 2019).

Large-scale investments of major tech companies into VR and MR hardware, such as *HoloLens*, *Meta Quest* and *Apple Vision Pro* point to a similar direction (Aupperlee, 2023; Jiang, 2024; Muehl, 2024; O’Hara, 2024; Rajan, 2023). The next steps towards immersive perception, AR contact lenses or implants (Azuma, 2017; Gmeinwieser & Schock, 2020), are likely to blend established boundaries of a perceived organic/technological divide even further, similar to 3D bio-printing. In relation to Coloniality, however, this blending bears both possibilities and risks. Generally, decolonial scholarship favours a dissolution of binaries, and movements towards more fluid, spectral conceptualisations in cultural production. However, to address the material realities of oppression and exclusion, there are cases which require a distinction between material and virtual interactions.

A critique by Fernando Maldonado-Torres (2010), for instance, illustrates how attempts to consider intersectional oppression in XR scholarship can result in a re-affirmation of White centrality and heteronormativity by blending racism with other forms of oppression. Maldonado-Torres’ example is Paul Dourish (2001), whose phenomenological approach to embodied interaction presumes a universalised, race-less body based on Eurocentric notions of embodiment. This debate is still prevalent: AR filters and AI-powered image generators presently struggle with the same biases (Anand et al., 2023; Gichoya et al., 2023; Jarrell & Peillard, 2023; Monteiro, 2023; Naik & Nushi, 2023), which indicates the urgency of developing solutions. Especially with AI entering digital culture as a fast-track multiplier of existing data biases (Geburu, 2020; Noble, 2020), it is imperative to conduct XR research which considers the future directionality of its field.

In current XR studies, this concern is not at the forefront of academic discourse (Alhakamy, 2024; Becker & Freitas, 2024; Kourtesis, 2024). This may be partially due to the relatively slow turnaround time of academic publications, the significant divide between commercial and academic XR development, or the lack of knowledge exchange between the many academic disciplines across which XR is used (Rahaman et al., 2019). Stuart Jeffrey (Jeffrey et al., 2020) describes XR research as a field which engages with ‘modes of co-production, physical

replication, and aesthetic quality’ as well as ‘authenticity’ (Jeffrey et al., 2021). While the ‘complex entanglements of its own production’ (Huvila, 2013) factor into XR-based spatial productions, authenticity in the sense of aesthetic naturalism is not central to my project. As aforementioned, a commitment to transparency and acknowledging intentionality is my priority over a misleading sense of authenticity based on visual accuracy.

I aim to engage with what Marcos Llobera (2007) calls the ‘subtlety of human environments’: the ever-present, but often overlooked aspects of shared spaces. Words like ‘silenced’, ‘omitted’ or ‘invisible’ tend to reproduce narratives which present marginalised communities as voice-less or victims. ‘Subtlety’, in contrast, suggests a presence which exists regardless of its recognition, and which becomes, once noticed, impossible to ignore. I interpret subtlety as a dimension which requires detailed attention in order to be highlighted, which corresponds with the first gap in XR literature that I seek to address with my work.

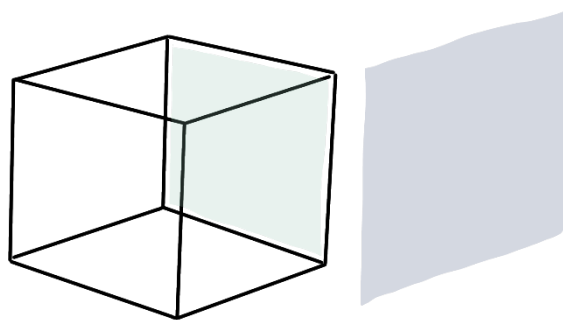
Despite various studies (Engberg, 2017; Herbst et al., 2008; Wither et al., 2010) proclaiming the need to design XR interactions *for*, not around a space (Wither et al., 2010), site-specific analytical approaches and design processes are exceedingly rare. A major portion of XR research focuses on user experience (Herbst et al., 2008; Hussein & Ali, 2021; Wither et al., 2010), technological experimentation (Cavallo et al., 2016; Hartmann & Vogel, 2021; Jin et al., 2022; Shin, 2021), pedagogical efficacy (Georgiou & Kyza, 2021; Remolar et al., 2021; Smørdal et al., 2016), or the ‘place-producing dimensions of an experience-driven application’ (Engberg, 2017, p. 3). The latter encompasses narrative-centric interactions which are projected onto specific locations, rather than necessarily emerging from the respective site-context itself. Part of my rationale for this thesis is to provide strategies which foster more cross-pollination of knowledge and experience between XR researchers across disciplinary sectors to support site-responsive immersive experiences.

Decolonial critique offers several other constructive avenues of broadening the critical contextualisation of current XR approaches. An example of this is a prevalent perspective in archaeological research, as articulated by Roosevelt et al. (2015), which frames digital technologies as a means of ‘non-invasive’ excavation. In the sense that XR has the ability to project additively as well as subtractively, this applies to the construction of spatial histories in XR as well. Dima et al. (2014) argue that XR’s ability to interact with heritage sites without causing material destruction is one of the main arguments for using immersive technologies in this context. However, from a decolonial perspective, what – or who – is non-invasive or destructive is very much determined by impact, not intent. Bagele Chilisa (2020) raises several ethical issues regarding the consideration of spirituality and human-object relations in Western-framed research, citing instances which are considered ethical by Western standards but violate the boundaries of Indigenous communities. Depending on the agencies considered, XR interventions can be destructive even if this destruction is not visible or deliberate. Thus, framing XR interventions as unilaterally ‘non-invasive’ reproduces Western conceptualisations of spatial boundaries and their ideological reverberations. Considering spiritual destruction or displacement can, depending on cultural context, be essential to assessing whether the use of this technological intervention is appropriate for a space.

Accordingly, this research’s question is not *whether* XR can provide critical contextualisations, but *how*. Without a thorough theoretical underpinning of critical perspectives, there is a risk that XR interactions provide superficial engagement at best (Rivera-Carlisle, 2023) or insensitively gamify trauma at worst (Townes, 2021). While simplified accounts of complex political issues can be helpful introductions to more differentiated literature, it is essential to draw connections to the deep-rooted epistemic changes which decolonial movements seek.

Otherwise, this content risks performing, rather than actually facilitating change. Hence, this form of spatial production bears a responsibility which other medial productions of space have not before. The interconnectedness of digital spaces and their increasingly user-generated content (Aichner et al., 2021; Graham & Zook, 2011; Kim, 2012; van Dijck, 2009) presents a level of potential colonial proliferation that far supersedes the influence of an individual newspaper, film, or academic critique. Therefore, the third gap in XR research which this work seeks to address is the management of power dynamics within XR co-creation processes. As I will outline in *Rhodes Not Taken*, an increasing reliance on user-generated content necessitates strategies for collective co-creation which are rooted in local practices and epistemologies, foster transparent processes of translating content into XR, represent a wide variety of perspectives, and efficiently utilise the experiential affordances XR technologies have to offer.

Another gap my research addresses is that of experimental narrative approaches within academic XR research. Drawing on my previous research in critical historiography, *Facets of Space* suggests a spatial approach to virtual histories. It employs an experimental approach to historically contextualising the site and its surrounding media discourse. This serves to demonstrate how academic critical contextualisation approaches may be adapted into this medium. It further seeks to exemplify that ‘gamification’ can come in many forms, and that with an eye on transparency, intentionality, and impact, many established, academically rigorous approaches can be adapted into XR content creation. The following two sections will provide a framing for these two aspects: gamification through XR, and spatial interventions through academic critique.



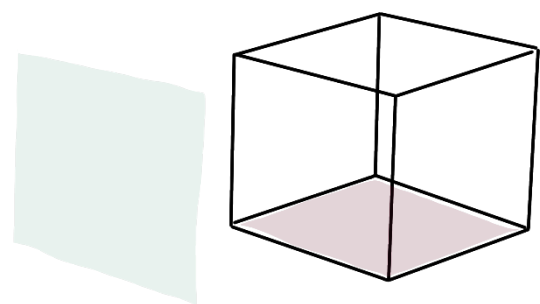
Side V: Games

This section introduces the critical Games Studies literature which portions of this thesis speak to. It critiques the use of gamification in addressing politically sensitive topics, such as trauma and historical violence, and argues for a nuanced approach which integrates decolonial critique and activism.

Centralising experience and interaction, rather than visual authenticity, is one of the objectives of this thesis. In critical Games Studies, there is an overt focus on interactivity: questions of how gameplay influences knowledge construction (Schrier, 2016, 2019; Shliakhovchuk & Muñoz García, 2020), how interactions and embodiment co-constitute one another (Alton, 2017; Bailey et al., 2016; Farrow & Iacovides, 2014), how virtual interactions influence behaviour (AlMarshedi et al., 2017; Ourdas & Ponis, 2023) and how the gamification of historical narratives influences player’s perception of history (Kee, 2011; McCall, 2016, 2022; Scholz et al., 2021;

Spring, 2015; Squire & Sasha, 2004) are central to this discourse. However, in addressing politically divisive subjects or challenging historical facts, the use of words like ‘gameplay’ or ‘gamification’ quickly becomes uncomfortable. Challenor & Ma (2019), for instance, do not speak of their virtual reconstruction of Auschwitz as a ‘game’, and in the context of Coloniality, considering the ‘gamification’ of addressing intergenerational violence and trauma appears insensitive at best. Even Serious Games which seek to tackle this complicated space (see McCall, 2022), are largely positioned in educational contexts where the youth of their target audience is used as a justification for ‘game’ elements. This stratification of who does and does not ‘play’ completely neglects that the spaces we collectively inhabit are already hybrid, and gamified interactions are embedded in the fabric of this hybridity. This disconnect ties back to the previously outlined concerns about transparency, intentionality, and impact: just because an XR interaction is not classified as a game, this does not mean that the mechanics of gameplay do not apply. Paper IV therefore leans on critical Games Studies to examine the potential material impact of the strategies it proposes.

Games Studies offer a variety of perspectives on gamification and in-game/out-of-game knowledge transferrals which translate into XR practice (Cairns et al., 2014; Hamari et al., 2016). Complimentary to relational notions of space which position immersive technologies as fluid elements of spatial production, this body of literature blends the boundaries of what is real and what is enactment, what is in-game and out-of-game. Gamification exists outside of digital contexts, on levels as fundamental as language (Chomsky, 2009; Wittgenstein, 1989), but in hybrid spaces, what counts as analogue, digital, virtual, or material requires increasingly nuanced engagements with the notion of in- and out-of-game boundaries. *Breaking the (Virtual) Chains* speaks to some of these nuances and puts literature on gamification in dialogue with activism strategies and decolonial critique. A core theme emerging from this intersection are the potential harms which performative or unreflected gamification may exert on social justice initiatives, marginalised communities, and shared spaces. Therefore, the final side of the contextual box addresses the centrality of material, conceptual, and metaphorical impacts in relation to this work.



Side VI: Impacts

This section introduces three key concepts — connectivity, affectivity, and embodiment — within XR contexts to draw connections between local and global enactments of Coloniality, as well as virtual and material dimensions of spatial justice.

Working with individual localities, rather than broad concepts of nations or civilisations, has allowed me, throughout this work, to use my chosen sites as prisms to refract connections between larger narratives. Focusing

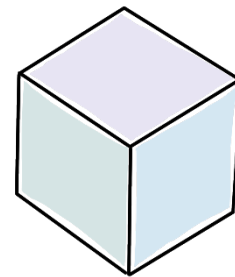
on Oxford, and on specific sites in Oxford, permitted me to reflect on the dynamics of Coloniality in England, and to conjecture on whether their echo constitutes some of the rhythms of spatial production elsewhere, too. This choice necessitates that this literature review jumps between the broad and the specific repeatedly to stay true to its ‘glocal’ (Massey, 2005) line of inquiry. One axis of consideration which is essential to the meta-reflection of this thesis, and to which degree it translates specific circumstances to a larger picture, and vice versa, is the notion of academic critique as a realm of spatial enactment.

Jenni Ramone (2019) argues that a ‘spatial theoretical framework informed by both postcolonial and Marxist spatial theorists ensures that the politics of space remains central to’ interpretations of urban environments (p. 960). This is separate from the *Secondspace* conceptualised by Soja (1996a) because academics are not necessarily the people inhabiting the places they are analysing. Rather, Ramone’s statement suggests multiple layers of interpretation and politicising which are inherent to a space as soon as it is subjected to academic critique. Eyal Weizman (2017) further states that it is not just interpretations and theorisations of space which project politics onto space but that ‘political rationalities, institutional conflicts, and the range of expertise which formed them’ (p. 6) are a constitutive part of the production of space. Both statements focus on different actors in this discourse: Ramone acknowledges that theorists reproduce their own sets of values in interpreting spaces, and Weizman points towards the underlying power dynamics which shape collective productions of space, both at analytical and habitual level. This multidimensionality of each sphere of spatial existence is crucial to my thesis: several of its approaches rest on the concept of layering different forms of spatial perception onto one another in non-hierarchical, co-present ways. The notion of academic critique as a form of spatial enactment also necessitates a level of self-reflection throughout this thesis, as its creation is not just an interpretation of the spaces it analyses, but an active part of co-producing each space. This will be particularly prevalent in *Breaking the (Virtual) Chains*, which engages with activist strategies for using XR in social justice contexts.

This is also the chapter which introduces three notions this thesis repeatedly draws on: connectivity, affectivity, and embodiment/embodiedness. Connectivity, in the context of the integrated paper, refers to Bennet & Segerberg’s (2012) division of digital activism into *collective* and *connective action*. In the context of the thesis, however, I have interpreted connectivity in both spatial and technological terms. The former, for instance, encompasses the Rhodes statue’s embeddedness in spatial relations to other depictions of Rhodes, narratives around Rhodes, and interest groups related to the multi-axial marginalisation which his legacy perpetuates. The latter repeatedly asks to which degree XR is central to the considerations put forward in each chapter, and how its spatiality affects what we know from other fields and research contexts. Both serve to assess a *sense of impact* between the ‘sense of reality’ and the ‘sense of possibility’ (Ferguson, 2011, p. 3) which govern spatial justice efforts.

‘Affectivity’ (Papacharissi, 2016) follows this sense of impact into a collective realm: it describes perceptions of ‘imagined communities’ (Anderson, 2006) between publics who participate in collective actions remotely and digitally, impacting their experiences of solidarity and mobilisation. This *Thirdspace* (Soja, 1996a) in which virtual and material interactions are experienced as hybrid is precisely where the underlying questions of this thesis reside. These question the ways in which we recollect our shared pasts, how individual narratives sit within these networks of connection, and who is being centralised in them. Blaagaard and Roslyng (2022) contrast this sense of imagined belonging with ‘embodiedness’, which they interpret as a discursive activist body in the context

of mediatisation (Reestorff, 2014). This closely connects to Guckelsberger et al.'s (2021) notion of 'embodiment' which denotes 'the bodily manifestations of socio-cultural concepts and ideologies as well as tangible and virtual bodies in material and digital spaces' (Rivera-Carlisle, 2021, p. 2). In the context of this thesis, 'embodiedness/embodiment' functions as a lens which considers the limitations and affordances of XR technologies in relation to connectivity and affectivity. It ties together three different aspects of thinking 'through' XR: as a spatial medium which co-exists in realms of connection, imagination, and material experience. Together, these three aspects serve to reflect on what constitutes impact in relation to XR.



Research Gaps & Challenges

The literature discussed thus far outlines four challenges which this thesis seeks to address: engaging with the 'subtlety' of human environments – that is, the socio-cultural and historical information embedded in spaces – through XR; developing systems and approaches which foster cross-disciplinary exchange and collaboration; addressing power dynamics in XR creation; and utilising experimental narrative approaches within academic XR research. I would not describe these as 'gaps' because there are projects and research which engage in these challenges, as will be discussed in the individual chapters of this thesis. Rather, I view these challenges as productive overlaps which are currently under-researched. For example, metadata management systems are a well-established branch of HCI research (Crystal, 2003; Dachsel et al., 2008; English et al., 2002; Greenberg, 2003; Hearst, 2007; Odom & Duel, 2018; Soto, 2023; Wilkinson et al., 2018), but there is hardly any research on applying their principles to spatial data and XR technologies. Simultaneously, there is a wealth of research into the practical limitations and affordances of technologically facilitated immersive interactions (Alhakamy, 2024; G. Baxter & Hainey, 2024; Borda & Molnar, 2024; Cho, 2018; Dixit & Sehrawat, 2024; Estrada Villalba et al., 2021; Gunn et al., 2020; Kidd, 2018; Montagud et al., 2020), but there are no taxonomies which categorise spatial echelons of information in order to make them translatable into other fields. Sarah Kenderdine (2021) calls for more experimental approaches to XR use in critical museology, which is a gap in current research, while there are numerous takes on theoretical narrative experimentation in other research areas. These areas, however, do not commonly employ immersive technologies, leaving an under-examined overlap of immersive tools on one side, and experimental narrative approaches on the other. My aim is to bring these literatures together, and to create a productive dialogue between them.

Contributions

While this thesis as a whole is intended as a contribution which productively overlaps decolonial theory,

practice-based XR research, and spatial histories, the individual chapters respond to specific works and theorists in their respective interdisciplinary environments.

Chapter 4, *The Blue-Tooth Spectrum*, speaks to HCI research emerging from Milgram & Kishino's (1995) *Reality-Virtuality Continuum*, and directly draws on contributions from Skarbez et al. (2021) and Stapleton and Davies (2011). It provides insights into the state of the art in reality/virtuality taxonomies and proposes a new conceptual taxonomy to position localities in space. Chapter 3 is predominantly aimed at HCI researchers, XR researchers, and designers.

Chapter 5, *Facets of Space*, builds on HCI research into conceptual metadata management structures, specifically drawing on Weiland and Dachsel's (2008) *Faceted Folders System* and Susan Dumais' (2018) *Faceted Search*. It offers insights into the development process of a spatial data taxonomy which facilitates interdisciplinary knowledge and information exchange. Further, it details a conceptual spatial data taxonomy for transparent, transferable, and structured analyses of shared environments. In applying this taxonomy to a prototype, it demonstrates the practical links between the integrated paper's propositions and possible outputs in XR. Chapter 4 is mainly intended for HCI researchers, XR researchers, and art historians.

Chapter 6, *Rhodes Not Taken*, contributes to an experimental branch of critical historiography, virtual histories. Particularly responding to the theoretical foundations laid out by Niall Ferguson (2011) and Robert Cowley (Bradley & Cowley, 2001). The chapter provides an experimental virtual history analysis approach which demonstrates this method's potential for fostering critical engagement with decolonial spatial histories, as well as an AR prototype which translates this potential to XR interactions. Additionally, *Rhodes Not Taken* provides in-depth insights into the political, financial, and spatial implications of its case study site, the Rhodes statue at Oriel College, Oxford. This chapter is angled towards historians, XR researchers, and designers.

Chapter 7, *Breaking the (Virtual) Chains*, directly builds on Poka Laenui's (2006) *Processes of Decolonisation* and Gonsalves et al.'s (2021) notion of *Radical Placemaking*, particularly drawing on Kari Kēhau Noe's (2021) XR design work. It provides a strategic framework for aligning virtual social justice interventions with material change, and details a prototype study which demonstrates the potential of centring material impact on marginalised stakeholder communities in heritage-centric XR design.

In addition to these outputs, the chapters collectively make two other contributions: Research-through-XR as an experimental methodology, and Critical Vandalisms as a conceptual framing for activist/academic research.

Closing Remarks: Opening the box

Space has been categorised in numerous ways to grasp its co-existence across various spheres of materiality, social production, interpretation, and imagination. Spatial theorists from a variety of disciplines have also convincingly argued that since spaces are manifestations of past and present ideologies, any space can offer a lens into the larger contexts of the society which built, inhabited, and maintained them. Simultaneously, this chapter has painted a broad panorama of XR research which engages with the main foci of this thesis, and outlined the gaps in the literature which this research aims to contribute to. The sides of the box which I see from the perspective of the researcher conducting this work reflect spatial theory, questions about the interplay of reality

and virtuality, the mediascapes and technoscapes in which these questions are embedded, positioning immersive technologies in this context, considering the risks and affordances of gamification, and examining different iterations of impact through these interactions. It is my hope that you, the Reader, will see other perspectives reflected off the sides of this box, and that through these reflections, this work takes shapes which are beyond my own limitations of positioning, perception, and expertise.

Before I move on to describe my methodological approach, I would like to add an informal objective which connects this work with the broader socio-cultural debates it intends to speak to. This thesis aims to examine how immersive technologies may enable us to relate differently to our collective pasts and environments. This requires a close look at how we narrate our collective histories through the spaces we inhabit. It requires an acknowledgement of who is represented and not represented in these spaces, and how this contributes to collective narrations of space. For me, the gaps in the literature this work aims to fill are not nearly as central to my research as the people who are absent from these debates due to the socio-cultural systems of exclusion in which academic discourse exists.



Chapter 2: Research Questions

Based on the gaps and overlaps identified in the literature review, this thesis addresses the following overarching research question:

How can immersive technologies be operationalised to critically contextualise spatial enactments of Coloniality?

‘How’ questions may seldom be answered conclusively, but this is very much intentional: the issues addressed in this thesis do not have definitive answers, and my research provides just one possible set of answers. The way this overarching question is broken down throughout the individual integrated papers follows a path of consecutive challenges. First is the challenge to build a shared language: in order to critically contextualise spatial enactments of Coloniality, we need structured ways of positioning a site in hybrid space (*The Blue-Tooth Spectrum*). Once we can articulate what this locality is and what it does, we can analyse it. For this analysis, a structured, transparent way of categorising spatial (meta)data is useful to foster interdisciplinary transferability and knowledge exchange (*Facets of Space*). Once a locality has been positioned and analysed, the next challenge is content creation. The subsequent chapter provides an experimental approach to this by leveraging virtual histories as a method to critically examine the embedded histories of our built environments (*Rhodes Not Taken*). A challenge which emerges from these different approaches to analysing and embedding spatial information for and through XR is how to ensure that virtual interactions are not merely performative, but actively support material change. Therefore, the next chapter examines strategies which can support an alignment of XR activism and material social justice outcomes (*Breaking the [Virtual] Chains*). Below is an overview of the research questions each section focuses on, to collectively address the motivating research question of how XR may be operationalised to critically contextualise spatial Coloniality:

RQ1

Chapter 4: The Blue-Tooth Spectrum (*Integrated Paper I*)

RQ 1: What are the gaps in existing conceptual XR taxonomies and how can we improve them to better position localities in space?

In order to address this question, this paper conducts a comparative literature review to critique existing extensions of Milgram and Kishino’s seminal RV continuum. Therefore, its first sub-research question is:

RQ1.1: How can the limitations of Milgram and Kishino’s RV Continuum be addressed to better reflect the contemporary realities of hybrid spaces?

The core of this paper’s critique rests on the notion that the separation between ‘real’ and ‘virtual’ as proposed by the RV continuum and its many adaptations is not representative of present hybrid spaces. We argue that emphasising experiential and relational characteristics of localities is as crucial to XR creation as their technological or ontological status. Thus, the second sub-research question is:

RQ1.2: What framework can be used to position localities in hybrid spaces in a way that centres the experiencer rather than the technology?

The proposed original taxonomy introduces eleven continua which focus on the direct relationship between experiencers and localities, bypassing the assumption of a distinct separation between virtuality and reality.

RQ2

Chapter 5: Facets of Space (*Integrated Paper II*)

RQ2: How can spatial (meta)data be organised in a structured, transferable, and transparent way to support the interdisciplinary and cross-industry exchange of data in XR interactions?

This paper proposes a taxonomy of spatial strata which can be adapted to various projects, fostering better communication, organisation, and accessibility of spatial data across disciplines and industries. The paper details the process of developing and testing this taxonomy through different user studies. Its embedded case study provides examples of how this taxonomy can be applied to a site.

RQ3

Chapter 6: Rhodes Not Taken (*Integrated Paper III*)

RQ3: How can spatial histories be re-narrated to make transparent the effects of Coloniality?

This paper addresses this question through two related, experimental approaches. The first utilises an original virtual history analysis to engage with critical questions emerging from colonial legacies in our built environments. The first sub-research question is:

RQ 3.1: How can alternative historical frameworks, such as virtual histories, help us critically engage with spatial Coloniality?

This analysis utilises the case study of the Rhodes statue in Oxford in order to demonstrate how counterfactual re-narrations of space can make apparent the connections between historical injustices and present oppressive structures. In order to investigate how such an approach may be translated into an immersive medium, the second part asks:

RQ 3.2: How can virtual histories be translated into XR to support critical engagement with spatial Coloniality?

The second case study examines how XR can facilitate critical interactions with a contested public space in a nuanced way. It considers the implications of virtual histories as a mode of engagement which challenges traditional forms of public memorialisation, as well as the potential of XR in supporting interactive re-imaginings of public spaces.

RQ4

Chapter 7: Breaking the (Virtual) Chains (*Integrated Paper IV*)

RQ4: How can XR-facilitated activism support material change?

This paper addresses the present underutilisation of XR technologies in social justice activism through two sub-research questions. The first is:

RQ 4.1: What factors shape the relationship between virtual interactions and material social justice outcomes?

The paper suggests that empathy, gamification, and monetisation are central factors in virtual interactions affecting material change. It discusses potential pitfalls like performative XR activism and misrepresentation, and promotes community involvement and transparency to mitigate these risks. The second sub-research question subsequently asks:

RQ 4.2: What strategies can support the creation of activist XR interactions to facilitate material social justice change?

This paper proposes a framework based on Poka Laenui's *Processes of Decolonisation* to outline steps between awareness and material change, which fosters emotional engagement, solidarity, and embodied experiences whilst also navigate the risks of XR use in activism.

Contributions

In addressing the above research questions, this thesis aims to make the following contributions to the existing literature:

- Chapter 4 – *The Blue-Tooth Spectrum*:
 - Insights into state of the art on reality/virtuality taxonomies
 - New conceptual taxonomy to position localities in space
- Chapter 5 – *Facets of Space*:
 - Insights into development process of a spatial data taxonomy which facilitates interdisciplinary knowledge exchange
 - Spatial data taxonomy for transparent, transferable, and structured analyses of spaces
- Chapter 6 – *Rhodes Not Taken*:
 - Virtual history analysis which demonstrates its potential for fostering critical engagement with decolonial spatial histories
 - Application of virtual history analysis to an AR prototype which demonstrates its potential for XR interactions
 - In-depth insights into the political, financial, and spatial implications of the case study site of the Rhodes statue at Oriel College, Oxford
- Chapter 7 – *Breaking the (Virtual) Chains*:
 - Strategic framework for aligning virtual social justice interventions with material change
 - A case study which demonstrates the potential of centring material impact on marginalised stakeholder communities in heritage-centric XR design

Chapter 3: Methodology

As this is an Integrated Thesis, each paper has its own Methods section. This chapter provides an overview of the methodology used throughout the thesis.

Approach

Borrowing from ‘research-through-design’ (Godin & Zahedi, 2014; Zimmerman et al., 2007a), I view the methodological approach of this thesis as conceptual ‘research-through-XR’. It encourages a thinking with and through immersive technologies in both theoretical and practical capacities. This thesis therefore takes a qualitative research approach, using in-depth data to answer research questions which are intentionally phrased to hold multiple possible answers. The thesis aims to foster a sense of polyvocality in interdisciplinary research, inside as well as outside of academia.

There are four methods which I particularly rely upon throughout this thesis: conceptual taxonomies, case studies, research-through-design, and prototype studies. Chapter 4, *The Blue-Tooth Spectrum*, develops a conceptual taxonomy and then applies it to the subsequent papers’ prototype study sites as a means of introducing and placing them on a spatial-interactive spectrum. Chapter 5, *Facets of Space*, also employs a conceptual taxonomy, based on an iterative research-through-design process with interviews and focus groups. *Facets of Space* and *Rhodes Not Taken* both have embedded case studies corresponding to a respective site in Oxford, UK, and prototype studies which utilise the same location. Chapter 7, *Breaking the (Virtual) Chains*, utilises a critical analysis for its conceptual contribution, followed by a prototype study which corresponds to another site in Oxford. All prototype studies involved parallel or iterative research-through-design processes.

In HCI (Human-Computer Interaction) research, conceptual taxonomies are often referred to as ‘ontologies’ to differentiate them from hierarchical data taxonomies (Costa et al., 2021). However, in the context of my research, the term ‘ontology’ risks being misleading, as my work also speaks to ontological considerations in the philosophical sense (Barad, 2003). This is particularly prevalent in Chapter 5, *Facets of Space*, and has been raised by reviewers in the past. In order to be terminologically consistent throughout the thesis, I therefore decided to refer to the approaches of *The Blue-Tooth Spectrum* and *Facets of Space* as conceptual taxonomies. However, it is worth noting that in contrast to HCI conventions (Costa et al., 2021), these taxonomies are not hierarchical. *The Blue-Tooth Spectrum* is based on Milgram and Kishino’s (1995) *Reality-Virtuality Continuum* and its accompanying taxonomy. It serves to position localities in hybrid space. *Facets of Space*’s taxonomy is based on Weiland and Dachsel’s (2008) *Faceted Folder System* and was developed through an iterative two-stage process based on Freeman and Curtis (2023). It is a spatial analysis tool designed to be used throughout the research, design, development, and feedback processes of creating location-responsive XR experiences. *Facets of Space* combines a conceptual taxonomy approach with a case study, applying the former to the site of the Indian Institute in Oxford.

The XR literature in which this thesis is grounded predominantly uses case studies to demonstrate its various lines of inquiry. As a well-established standard in the field, case studies are particularly suitable for XR research which is location-specific (Baer et al., 2022; Bowser et al., 2013; Harley et al., 2016). Case studies, defined by

Creswell et al. (2007) as explorations of ‘a bounded system (a case) [...] through detailed, in-depth data collection involving multiple sources of information (e.g., observations, [...] audiovisual material, and documents and reports)’ (p. 245), are therefore a suitable method to answer my research questions in line with academic disciplinary standards of the field this work seeks to contribute to. The case studies in this thesis are qualitative, location-specific case studies which allow me to examine larger contextual connections through the lens of a single site. Case studies are typically specified by their contexts, boundedness, and experience (Stake, 2006). Therefore, this chapter describes their selection, boundaries, and function within the thesis in detail.

Both in the development of the taxonomies and in translating the papers’ conceptual contributions into XR, I employed a research-through-design approach based on Zimmerman et al. (2007b). They describe research-through-design as an ‘active process of ideating, iterating, and critiquing potential solutions’ in order to produce ‘artifacts intended to transform the world from the current state to a preferred state’ (p. 497). In this thesis, these processes of ideating, iterating, and critiquing encompass conceptual explorations, practical design experimentation, and the incorporation of user feedback. The ‘artifacts’ which this thesis puts forward are the taxonomies and prototypes which resulted from these research-through-design processes.

Prototypes are critical for ‘inquisitive exploration of concepts’ (Camburn et al., 2017), which is one of the main approaches I have taken in this thesis. My aim is to provide other researchers and practitioners with operational strategies and ways of thinking with, for, and through XR which they can adapt to their work. Thinking ‘through’ (Gilquin & McMichael, 2008) immersive technologies has been instrumental to my research and I view it as essential to a more experimental culture of engagement (Kenderdine, 2021) with shared heritage and critical spatial co-production. Throughout this thesis, I refer to the sections developing prototypes as ‘prototype studies’ to distinguish them from the embedded case studies and the actual prototypes, respectively. These prototype studies are based on Lim et al.’s (2008) prototyping principles, which acknowledge that prototypes are separate from final design forms and that they ‘can significantly affect the ways of perceiving the manifested ideas in various situations of using the prototypes’ (p. 24). Accordingly, my prototype studies are a form of research experimentation, not finalised versions of an XR app.

The following sections will discuss these approaches and their interplay in the thesis in more detail.

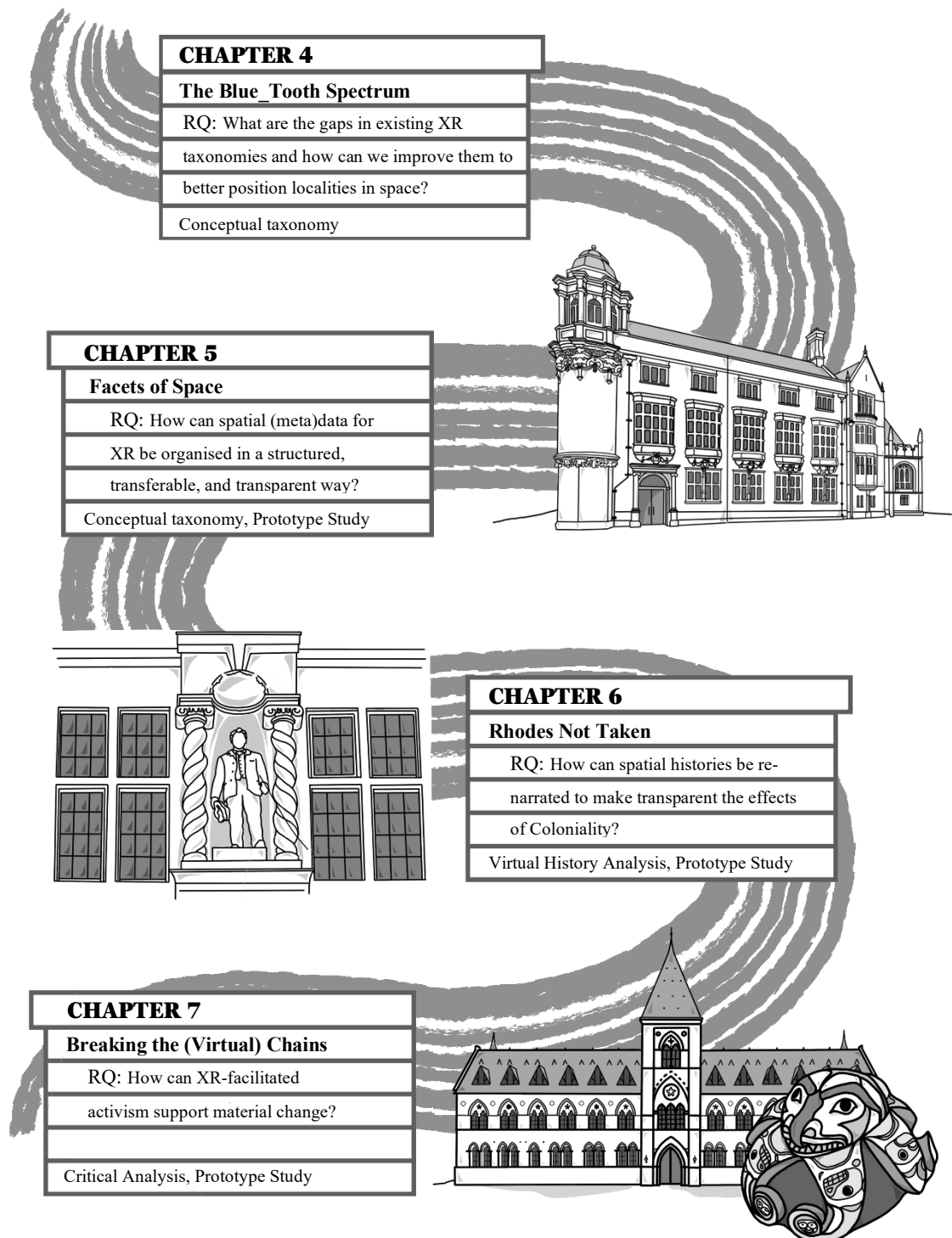


Figure 2: Overview of core chapters of this thesis, their research questions and key methods.

Research Stance & Methodological Framing

Ravitch & Carl (2021) argue that qualitative research lends itself particularly well to ‘bridging’, the process of ‘making connections horizontally and vertically’ (p. 8). It is this form of connection-making which this thesis aims to engage in: to bridge communication gaps between academic disciplines and areas of industry research, to outline strategies which connect the knowledge repositories of one area of critique with another, and to provide access routes to utilising immersive technologies for people who do not mainly operate through this medium. Moreover, qualitative research produces in-depth data on subjective experiences and nuanced human behaviour in relation to structural constraints (Ravitch & Carl, 2021), which is suitable to the spatially rooted nature of my research. Early in the research design process, I evaluated the potential of using a mixed methods approach, combining qualitative and quantitative approaches. However, there were two key aspects who led me to pursue a purely qualitative methodological framing.

Firstly, given that this thesis is centred around an emerging technology which brings with it a discourse full of quantitative assumptions and Big Data solutions (Nakamura, 2020), I was concerned that a quantitative approach would contribute to this tech-solutionist side of XR discourse. By grounding this research in decolonial theory and activism, I positioned it in juxtaposition to quantitative approaches which seek to generalise, rather than to promote specificity in polyvocality. Thimm et al. (2017) frame polyvocality as an extension of intersectional analysis, which seeks to erode the categories created by Eurocentric research approaches. Therefore, utilising quantitative methods which would require me to reproduce some of these categories in order to analyse large datasets would have been contradictory to the critical positioning of this thesis, and finding creative ways of conducting quantitative research without said categories would have been an entirely different research undertaking.

Secondly, as my initial readings began to shape my research questions, none of them seemed to be best answered with quantitative methods. The first portion of RQ 1 (*What are the gaps in existing conceptual XR taxonomies?*) could have been approached through a quantitative systematic literature review of existing taxonomies, but this research had already been done relatively recently (Skarbez et al., 2021), which would have made another systematic review superfluous. Instead, my co-author and I focused on conducting a qualitative literature review of texts which added to Milgram and Kishino’s (1995) *Reality-Virtuality Continuum*, as well as meta-level reviews which reflected on the overall development of this branch of HCI research. The second part of RQ1 (*How can we improve existing conceptual XR taxonomies to better position localities in space?*) could best be answered qualitatively through the development of a new taxonomy. Similarly, RQ2 (*How can spatial (meta)data be organised in a structured, transferable, and transparent way to support the interdisciplinary and cross-industry exchange of data in XR interactions?*), RQ3 (*How can spatial histories be re-narrated to make transparent the effects of Coloniality?*) and RQ4 (*How can XR-facilitated activism support material change?*) are essentially qualitative research questions which call for qualitative methods.

Given that it is part of my research objective not to produce a false illusion of generalisability based on location-specific cases, the limitations of transferability in qualitative research (Flyvbjerg, 2006) actually work in my favour. Not only are qualitative methods most efficient for answering my research questions, they also do not invite inferential generalisations and therefore underline the local specificity which this research seeks to underline.

Research Design

The central portion of this thesis consists of five chapters: four integrated papers, three of which contain a corresponding prototype study, and a Discussion which considers of the interplay between them and introduces the notion of Critical Vandalisms. This structure is echoed in the five phases of this research design: Phases 1-4 represent each of the papers and their prototype studies, while Phase 5 combines the papers' propositions in a reflection. Since the papers integrated into this thesis are practice-oriented in their output, whether or not their propositions are effective solutions cannot be answered in a binary way. Therefore, the prototype studies do not serve as a test of each paper's propositions, but as illustrations of XR's potential to translate them into an interactive medium.

The proposed approaches can be used individually or in concert. If the conceptual approaches were applied to one project, they would likely intersect in non-chronological ways, but the order in which they appear in this thesis follows a logic of positioning a locality in space (*The Blue-Tooth Spectrum*), conducting a structured spatial analysis (*Facets of Space*), creating experimental content (*Rhodes Not Taken*), and connecting virtual interactions with material impact (*Breaking the [Virtual] Chains*). *The Blue-Tooth Spectrum* introduces the subsequent chapters' case study sites by applying the proposed taxonomy to them. For the following chapters, prototypes were developed alongside the papers with both informing each other.

Key Methodologies

Conceptual Taxonomies

As outlined above, conceptual taxonomies are a frequently employed method in HCI research (Augstein & Neumayr, 2019; Chignell, 1990; Costa et al., 2021). While Mark Chignell (1990) acknowledges that 'a tangled network might ultimately be more appropriate' (p. 27) to create associative links between information points, conceptual taxonomies foster a shared understanding of 'modalities, methods, technologies, and devices' (Augstein & Neumayr, 2019, p. 27). The two taxonomies presented in Chapters 4 and 5, respectively, take Augstein and Neumayr's 'human-centred' approach (ibid.), but are both based on different organisational principles and rooted in different HCI literatures. These are discussed in detail in the respective papers. While *The Blue-Tooth Spectrum* uses the subsequent papers' prototype study sites as examples to apply its proposed categorisation principles, *Facets of Space* has an embedded case study, situated at the Indian Institute in Oxford, to demonstrate how its strata may be applied to a site.

Case Studies

Case studies are a valuable methodological approach for site-specific research and the exploration of immersive technologies due to their capacity to provide rich, contextualised insights (P. Baxter & Jack, 2008). Unlike large-scale surveys or decontextualised experimental studies, case studies allow for an intense focus on one particular setting or instance, capturing the nuanced interactions between people, places, and technologies. Bent Flyvberg (2006) singles out qualitative case studies as an approach which allows for thorough engagement with modes of contextual and situational knowledge production. Case studies have a long history of being used

as an interdisciplinary method (Mills & Birks, 2014), and as a ‘pragmatic, flexible research approach’ (Harrison et al., 2017), they are particularly suitable for research areas which draw on a multiplicity of theoretical framings and practical applications.

A qualitative case study which had a particular impact on my choosing of this approach for this thesis was Challenor & Ma’s (2019) review of AR applications in heritage visualisation, which used a practice-based project at the Auschwitz memorial site as its central case study. Their analysis of how their virtual interactions and considerations as designers and researchers developed around, with, and through this highly politically charged memorial site indicates how central location-specificity is to thorough historico-cultural analysis in XR. Auschwitz is an example of a site which has representative and symbolic value, as just one of many concentration camps, but it also has a unique position within the context of death camp infrastructures. Challenor & Ma make transparent that while their XR experience could be adapted to other, comparable sites, each camp would need its own process of evaluating priorities and interactions based on its specific history. I chose case studies as one of my main methodological approaches because I believe retaining this specificity is essential to creating more polyvocal narratives of shared material and immaterial histories.

Another factor which made location-specific case studies a particularly useful approach for this work was that in their spatial specificity, these sites allow for a triangulation of data from various sources (Pearson, 2017). Putting a pin on an imagined map allowed me to investigate each space in-depth, observe people passing by these sites, and talk to them about their experiences. For my research, it was crucial to have a spatial ‘rooting’ for my considerations, whether this was one spatial configuration or a collection thereof.

I use a collective case study approach (*Encyclopedia of Case Study Research*, 2024) encompassing three sites in this thesis. Two of them are embedded case studies (*Facets of Space* and *Rhodes Not Taken*) and double as sites of the prototype studies, whereas one is only a prototype study (*Breaking the [Virtual] Chains*). I thoroughly considered just using one central case study to apply my conceptual considerations to but throughout the process of working on the individual papers, I realised that in the narrative of a thesis, focusing on one case study would give disproportionate weight to this one site. The strategies and tools presented in this thesis are intended for adoption to different types of sites, and by applying them to a variety of locations, the focus remains on that transferability. While my selection of case study sites is by no means representative of all forms of spatial production, or even spatial co-production in relation to shared heritage, having a variety of spatial scopes is more indicative of how I see this work being applied elsewhere. Henceforth, I will distinguish between ‘case studies’ as referring to the embedded case studies in Chapters 5 and 6, and ‘prototype studies’ to describe conceptual actualisations in XR. However, since there is an overlap of localities between these two modes of engagement, I refer to the chosen sites as both ‘case study sites’ and ‘prototype study sites’ interchangeably. I will detail the boundaries and selection process of these sites after introducing my approach to prototyping through research-through-design.

Research-Through-Design

Research-through-design is an approach which addresses ‘the possibilities and problems implicit’ to research propositions by articulating ‘a range of topical, procedural, pragmatic, and conceptual insights’ through design processes (Gaver, 2012, p. 937). In this thesis, I used research-through-design in the development of both

conceptual taxonomies and prototypes. These processes happened in parallel to and in dialogue with one another, with my conceptual considerations shaping design choices and prototype development influencing my theoretical engagements. In *Facets of Space* and *Rhodes Not Taken*, these processes form a close connection between the embedded case studies and the prototype studies, with the latter building on the former. In *Breaking the (Virtual) Chains*, the prototype study introduces a complimentary, but distinct conceptual contribution, which is representative of the prototype following a different path of inquiry through research-through-design than the paper itself.

The taxonomies of the first two papers both involved separate research-through-design processes based on Zimmerman et al. (2007b) – the former as a collaborative co-design process, the latter as an iterative design process based on Freeman and Curtis (2023). I will detail these in the *Methods per Research Design Phase* section below. Before introducing my approach to the prototype studies, I want to underline that research-through-design has been a method as much as a research ethos throughout this thesis. Irrespective of whether I had my social scientist hat on, my historian hat, or my developer hat, I aimed to approach each challenge outlined in this thesis with the creative openness of a research-through-design approach whilst holding myself accountable to academic rigor and transparency (Beacham et al., 2006). This includes observing Zimmerman and Forlizzi's (2008) stipulation that in order for research-through-design to function as a rigorous academic method, 'a level of extensibility and verifiability' has to be evident through the ways in which design-based research propositions are translatable into practice (p. 33). Throughout this thesis, I have implemented this by translating my conceptual propositions to XR, but also feeding back my findings from developing XR prototypes into the papers. The emerging approach, which I refer to as 'research-through-XR', is the methodological cornerstone of this research.

Prototype Studies

Camburn et al (2017) point out that prototyping has a long history of supporting scientific development, and that many innovations were based on iterative trial and error cycles. The Dyson cyclonic vacuum, for instance, took 5127 prototypes to reach its mass-marketable version (Dyson, 2003) and while there is a difference between developing experimental prototypes and creating an engineering solution, this is indicative of how many steps of adjustment a development process can take from start to finish.

John S. Gero (1990) describes this exploration process as 'positing functions to be achieved and producing descriptions of artifacts capable of generating these functions' (p. 27). In order to make decisions in the design process 'before all the relevant information is available' (p.29), researchers must schematise their knowledge. Design prototypes are one of these possible schemata. Gero defines design prototypes in a relatively abstract way: as conceptual schemata 'for representing a class of generalised heterogeneous grouping of elements derived from alike design cases' (p. 30) which form the basis and continuation of an exploratory research process. A crucial point here is that any prototype is based on an assumption of alike cases, which means its basis is always already-embedded in contextual discourse, and reflective of work which preceded it. Moreover, Gero positions design prototypes as a representation framework which expresses the conceptual foundations of knowledge reproduction and contextual assumptions within an iterative design process. I chose design prototypes as a complementary method to my papers because – depending on one's contextual knowledge and skill sets – translating the

conceptual contributions of the papers into XR is not a straight-forward process. Therefore, the design prototypes act as a representation framework for the concepts conveyed in the papers. However, as the prototypes were developed in dialogue with the papers, their processes did not necessarily neatly align. Rather, producing the prototypes opened new lines of inquiry, just as testing phases led to new refinement objectives.

Prototyping Objectives

The initial core objectives of employing design prototypes as a method were communication and exploration. While communication is more commonly framed as a prototyping objective in the context of conveying conceptual information to a larger research team (Tai, 2005), my aim was to translate my papers' conceptual contributions into a direct application in XR. The reason this was a priority was that this is not an established process in the respective fields in which the papers sit. Milgram and Kishino's (1995) *Reality-Virtuality Continuum* and its successors, which the first integrated paper's taxonomy is based on, do not include translations in XR applications, but rather speak about their applicability in theoretical terms. *Facets of Space's* spatial data taxonomy can sit in several analogue and digital realms, but its application in XR is, again, less established in the contextual literature. Virtual histories, the core approach of *Rhodes Not Taken*, has, to my knowledge, no academic history of translating its analytical approach into XR. Similarly, translating decolonial approaches to activist interventions into XR is not a well-established mode of conducting research in this field. I therefore intended to translate each of these three papers into an XR prototype, but the resulting prototypes are not equally representative of and connected to their respective papers.

A key factor in this difference between intention and implementation is my second prototyping objective, exploration. The prototypes were not just intended to represent and communicate, but to further the conceptual research in their own right. This is particularly apparent in *Breaking the (Virtual) Chains* and *Steal It Back*, which were developed in dialogue with one another, but shaped into distinct contributions which are not necessarily representative of one another. This signifies a divergence: a generating of new concepts based on the prototype, rather than a convergent approach in which several options are narrowed down to one line of inquiry (Dow et al., 2010). In the previous work discussed in Chapter 5 (*Facets of Space*), I developed a prototype with an objective of refinement which was purposefully designed to encourage convergence. The point was to optimise usability of a mapping interface which would lead experiencers to a specific site. Regardless of this prototype being designed for convergence, user testing still led to divergent experiences, offering new paths for the prototype and further development options. For the prototypes in this thesis, however, the approach was divergence-focused to begin with, centring the potential of exploring further development paths and new conceptual challenges.

Even though active learning and refinement, two other well-established prototyping objectives (Camburn et al., 2017), were not part of my initial research plan, they did emerge through the process of prototyping. Active learning is an advancement of analytical models and tacit knowledge production through prototyping (Telenko et al., 2015). For the *Facets of Space* taxonomy, active learning has been a core component of its development process, even though it was not one of my prototyping objectives. Perhaps this attests to my relative naiveté when first engaging with prototypes: I expected them to be a different medial form of the conceptual work I had done in writing, not an independent contribution to furthering my thinking about these concepts. However, in actuality, the papers, as they are presented in this thesis, would not exist without their respective prototypes, and vice versa. Similarly, I did not outline refinement as a prototype objective, because I thought this would be more suitable to

a larger-scale user testing phase, which would be beyond the scope of this thesis. However, with each prototyping step – in both high and low fidelity – refinement emerged almost as a side-product.

One of the limitations Camburn et al. (2017) discuss in relation to iterative prototyping is the interplay of testing feedback and fixation. They argue that there is a correlation between the fidelity of a prototype stage and how fixated its embedded solutions become. In qualitative studies which work with relatively low numbers of test users, there is a risk of fixating on specific aspects, or paying too much attention to specific solution approaches based on anecdotal feedback (Kershaw et al., 2011). A mitigation strategy to this is to time feedback loops well: this means having clear feedback objectives at each stage of user testing, and to select feedback groups according to these objectives. I have sought to implement this in this thesis by testing initial prototypes with user groups who have specific expertise, and by not rushing to produce an end-user high-fidelity prototype to the detriment of thorough conceptual development. This is one of the reasons why this thesis does not include a large-scale user study. My concern was that conducting such a study would create a false sense of being able to quantify how effective my proposed translations are, and that it would hold my conceptual propositions to a yardstick which does not map onto my research questions. My aim was to provide strategies and tools which can be adapted to a wide range of work, not to measure whether these are the best possible tools, or how they compare to other approaches. The premise of an experimental research culture is that different approaches may co-exist and generate new ways of thinking through technologies without being put in a hierarchical structure which pits these approaches against one another.

As aforementioned, the localities used in the case studies overlap with those of the prototype studies. Therefore, the below section details site boundaries and selection.

Site Selection

Boundaries of Cases

Each prototype study involved the selection of a conceptual proposition to translate into XR and a sample locality. To provide an example: the virtual histories analysis (*Rhodes Not Taken*) could have been applied to various sites, but it could have also resulted in a different XR iteration of the same site, via an alternate design process. A dozen creators provided with my virtual histories analysis may have created a dozen different XR interactions based on the information provided. The prototype studies serve to demonstrate one possible path, not to suggest a comprehensive representation of all the possible options. One of the affordances of immersive technologies is that they are infinitely adaptable, and choosing one content creation approach per site is a way of illustrating at that potential. This is also the reason why I did not cross-trial content-creation approaches with different sites: the objective was not to manufacture a sense of one approach being superior to another at a particular site, but to highlight their expansion potential across different sample sites. I intentionally selected three sites with contrasting contributions in relation to possible XR interactions with built environments: an external locality (a statue elevated high above a busy street), a whole building (considering both its positive and negative spaces), and one artefact kept inside a museum (a helmet in a cramped glass cabinet). These pose different challenges which productively speak to one another through the prototype studies.

Sample Pool

As outlined in the Introduction chapter, there are three main reasons why I chose British Spatial Coloniality as the focus of this work: the magnitude of global impact of the British Empire (Gildea, 2019), the ‘pervasive presence’ (Nabulsi, 2017) of coloniality in Britain, and the cultural struggle – or deliberate resistance – to acknowledge and address this presence. Within Britain, England is the locality where the power and influence of the British Empire has historically been rooted, and the other parts of Britain hold their own claims to being subjects of English oppression. While there are arguments to be made for the rest of Britain benefiting from British Imperialism to this day, the historical concentration of power and wealth in England makes this a logical starting point. If future researchers were to investigate how the propositions in this thesis may be applied to a Scottish or Welsh context, for instance, another layer of nuance would need to be added to account for the local forms of oppression which overlay the macro-narrative of British Imperialism. A crucial factor in this consideration is who has, historically, held positions of power within the Imperial project, and thus disproportionately benefitted from colonial oppression abroad. Within England, Oxford – both as a city and an institution – has played a vital historical role in producing and perpetuating these power dynamics.

Richard Symonds (1991) describes Oxford as both the site where the men at the helm of the British Empire were educated into Imperialists, and the place which reproduced their ideologies through printing their writings, schoolbooks, and encyclopaedias. To link the locality of Oxford to language imperialism and the linguistic reproduction of colonial values one only has to look as far as the Oxford English Dictionary, the Oxford comma, or the people who spread English across the globe. It was Oxfordians who documented the first British voyages to the Americas, and many statesmen who controlled parts of the Empire were educated in Oxford (Symonds, 1991). The close interconnectedness of Oxford Colleges, Church, and State was not unilateral, however, with the East India Company funding several scholarships (Hunter, 1896) and the university investing in colonial trade.

While similar narratives can be attached to other elite educational institutions in England, Symonds (1991) distinguishes some characteristics which make the relationship between Oxford and the British Empire particularly apparent:

‘One was the preponderance of Oxford men in the posts in which Imperial policies were decided and implemented. During the high period of Empire between 1880 and 1914 the Prime Minister and Foreign Secretary were usually Oxford men; in the Indian Civil Service and Sudan Political Service Oxford men outnumbered Cambridge men by almost two to one. Over the whole period of British rule in India 15 Governors-General or Viceroys came from Oxford’ (p. 3).

Rhodes himself has been quoted as saying ‘wherever you turn your eye – except in science – an Oxford man is at the top of the tree’ (Alexander, 1914, p. 259). While the imprint of ‘Oxford men’ abroad is widely documented, the reactionary influence on their home country is equally apparent. As aforementioned, according to William Cohen (1989), White elites of the past sought to ‘perpetuate their values in the space they dominated’ through statues, memorials, and other manifestations of power. This was their way, Richard Drayton (2019, p. 653) argues, to ‘rehearse permanently the violence of domination’. In the city of Oxford, this manifestation of power executed abroad is evidenced by numerous locations, many connected to the university. From the All Souls College’s former *Codrington* Library and the former *Indian Institute* to the former Institute of Forestry, where Imperial officers were educated to oversee the teak deforestation in India (Burley et al., 2009), or the Anthropology department which used to run summer trainings for colonial officers – one does not have to search

far to identify spatial manifestations of colonial domination (and subsequent renaming strategies).

However, there is also a long history of resistance to these spatial narratives, from the first Black Rhodes Scholar to contemporary student-led initiatives like Rhodes Must Fall (RMF) or the *Uncomfortable Oxford* tours, which call the existing dynamics of privilege in the city into question. The university-run Pitt Rivers Museum is an industry leader for fostering decolonial dialogue with British collection museums, and for every national institution's historical arc of entanglement with coloniality, there is an Oxford site to match.

I chose Oxford as the sample pool for my prototype study sites based on the following criteria:

- Prominent role in shaping ideas of Empire at national and global levels
- Continuous influence and entanglement with colonial histories
- Centre of development and exchange of colonial discourse and trade
- Significant influence on key figures of power throughout the history of the British Empire
- Close entanglement with British governance and foreign policy
- Counter-influence of Empire is spatially apparent (e.g. architectural features, how international the population is in proportion to the city's location and size)
- Presence of local decolonial activism
- Representative of dual positionality which UK educational institutions inhabit in relation to decolonial discourse
- Oxford's well-documented, unique historical position as a centre of ongoing cultural-political influence

Weighting of criteria

While many of these factors also apply to other places in England – London, Cambridge, Bristol, to name a few – it is Oxford's unique position of having educated so many Imperialists, shaped colonial discourse in Britain, and continuing this influence into the present, which outweighed other options. While London may have been the political, logistical, and commercial centre of power in the Empire, Oxford is where that power was bred. With the objective of un-learning, un-thinking, and un-ravelling the colonial narratives which engulf our shared understandings of culture and history, it therefore makes sense to start here, at the forge where Imperialists learned their craft.

Criteria for Prototype Study Sites

Oxford's inner city – and the main University sites – being in relatively close proximity opened the possibility of connecting several sample sites through a walk. Some options I contemplated in the early stages of this project, like the Boer War Memorial in Headington, were difficult to access in sequence with other sites. While proximity was not the main deciding factor in choosing or dismissing a potential sample site, it did play into the decision process. I selected the three prototype study sites based on the following criteria:

- *Dimension of spatial coloniality*: A site needed to embody a dimension of spatial coloniality which was of relevance to my research questions.
- *Discursive relevance*: While many sites embody a dimension of spatial coloniality, some do so much

more prominently than others.

- *Transferability*: A site needed to be representative of a larger context within spatial coloniality which is transferrable to other sites (in the UK and/or abroad).
- *Mapping onto paper propositions*: A site needed to be an appropriate application for one (or more) of my integrated paper propositions.
- *Accessibility*: A site needed to be physically accessible and suitable for XR interactions
- *Contextual data density*: A site needed to have sufficient contextual data available to demonstrate the application options in XR.
- *Repetition*: Of the possible sites, I sought to avoid repetition of similar themes or types of sites (e.g. not selecting three libraries) to not create the impression that certain sites were more suitable than others.
- *Proximity*: Of the possible sites, the final selection factored in the path between them, favouring sites which could form one cohesive experience as part of a future connection of the developed prototypes.

Weighting of Criteria

I weighted the above criteria in the order in which they are listed: embodying a dimension of spatial coloniality or physical accessibility were essential criteria, whereas avoiding thematic repetition and selecting for proximity to other sites were preferences. Examples of sites which qualified for *Dimension of spatial coloniality*:

- The Boer War Memorial
- The Rhodes Statue
- Rhodes House
- The Rhodes Plaque
- All Souls College Library
- The Radcliffe Camera
- The Sheldonian
- The Institute of Plant Sciences
- The Indian Institute (Oxford Martin School)
- The Oxford University Press
- The Pitt Rivers Museum
- The Ashmolean Museum
- The History of Science Museum
- Several Oxford Colleges

Selecting for discursive relevance was closely interconnected with selecting for data density and transferability. A site like the Rhodes statue has more transferable aspects to questions around the removal of colonial statues in the UK than a site like Rhodes House, even though either could be used to engage with the public discourse around Rhodes. While many Oxford buildings could serve to engage with colonial dimensions of institutional oppression, the Institute of Plant Sciences is contextualised by a book detailing its history, and the

former Indian Institute has a repository of historical images online. This is not to imply that I only considered sites with vast information available about them – rather, I tried to balance contextual-information-rich sites with less heavily narrated examples.

Transferability, for instance, excluded sites like the Oxford University Press, which has a relevant, but highly unique position within the history of academic publishing, and would therefore not be as suitable for transferable applications as other sites. After accounting for the first six criteria, the following possible sites were left:

- The Boer War Memorial
- The Rhodes Statue
- The Institute of Plant Sciences
- The Indian Institute (Oxford Martin School)
- The Pitt Rivers Museum
- The Ashmolean Museum
- The History of Science Museum

I selected the Pitt Rivers Museum over the Ashmolean and the History of Science Museum because of its long-standing history of engaging with decolonial discourse. In terms of being a suitable choice as a prototype study for *Breaking the (Virtual) Chains*, it was clear that the actual sample would have to be an exhibited artwork within the museum, but this could have worked in either option.

- The Boer War Memorial
- The Rhodes Statue
- The Radcliffe Camera
- The Institute of Plant Sciences
- The Indian Institute (Oxford Martin School)
- The Pitt Rivers Museum

Proximity was the final criterion which dismissed the Boer War Memorial, and the Institute of Plant Sciences. The latter could have been just as good a fit for *Facets of Space* as the Indian Institute (Oxford Martin School), but the Indian Institute was in a more convenient location on the path between the other sites. Proximity may appear odd a criterion in hindsight, but when I first selected sites, there was a potential of creating one prototype which would combine the sites together. Even though this is not the path my research took, this possibility influenced my choices at the time.

This led me to my final selection:

- The Rhodes Statue (*Facets of Space*)
- The Indian Institute (*Rhodes Not Taken*)
- The Pitt Rivers Museum (*Breaking the (Virtual) Chains*)

Selected Sites

The Indian Institute (Oxford Martin School)

The Indian Institute was established in 1883 to promote the study of Indian culture, languages, and history. The Institute was initially funded by a donation from Maharaja Sayajirao Gaekwad III of Baroda and fundraising from wealthy donors, including Queen Victoria. The Indian Institute was originally housed in a building on Broad Street designed by Basil Champneys in the Indo-Saracenic architectural style. The Indian Institute played a key role in fostering academic ties between Britain and India during the British Raj and significantly influenced the perception of Indian culture in Britain. Even though it was originally intended for cultural exchange – with boarding rooms for Indian students and visiting scholars built in – its actual utilisation saw European scholars studying Indian culture, specifically Sanskrit. In 1968, the Institute's focus shifted, and it was integrated into the Faculty of Oriental Studies, eventually leading to the building's repurposing. In 2005, it was renamed the Oxford Martin School after donor Dr James Martin, and repurposed to host a roster of interdisciplinary research programmes in the Social Sciences Division. Throughout this thesis, I refer to it as the Indian Institute as this was what the building was initially created for, and the historical aspect of its naming which is not subject to further change in the future.

- *Dimension of spatial coloniality*: Appropriation of cultural materials, institutional influence on cultural representation
- *Discursive relevance*: Exemplifies institutional appropriation and influence
- *Transferability*: Representative of many other University of Oxford buildings
- *Mapping onto paper propositions*: Suitable for *Rhodes Not Taken*
- *Accessibility*: Good footpath access, publicly accessible exterior
- *Contextual data density*: Heritage England image database, local histories
- *Repetition*: I chose this over other departments with relevant histories (e.g. Institute of Plant Sciences) because of its locality and the relatively well-intended context of its history [to present a balanced perspective]
- *Proximity*: Proximity to other sites played a crucial role in selection



Figure 3: Illustration of the former Indian Institute on Broad Street, Oxford.

Rhodes Statue

At the front of Oriel College, elevated above Oxford's busy High Street is a statue of Cecil J. Rhodes, a British Imperialist who brutally subjugated large parts of Southern Africa. The Rhodes statue is positioned above six other, life-sized statues – two kings and four provosts – and was made the same sculptor (Alfred Bertram Pegram) who also made the Cape Town Rhodes sculpture (Muir, 2013). Chigudu (2021) argues that the statue 'perfectly distils ... imperial nostalgia into a concrete object' (p. 42). Seen as representative of White supremacist ideologies and colonial exploitation, the Rhodes statue has been subject of significant controversy. As K. Murris (2016) states, its presence casts 'a shadow on black and other students alike..., who struggle to identify with, an institution that harbours a statue immortalising a British Imperialist'. Since 2015 the *Rhodes Must Fall* (RMF) movement made transparent the Oxford Rhodes statue's connection to its South African counterpart, which was removed for the campus of the University of Cape Town (UCT), South Africa, after student protests. In Oxford, however, the potential removal of the statue has been as contested as it has been demanded, leading to it becoming a lightning rod of national debate in 2020, in the wake of the Black Lives Matter protests. Regardless of significant public interest in the removal of the statue, Oriel College stated in 2021 that they 'carefully considered the regulatory and financial challenges, including the expected time frame for removal, which could run into years with no certainty of outcome, together with the total cost of removal' (Oriel College, 2021) and chose to keep the statue where it is.

- *Dimension of spatial coloniality*: Statues as representing colonial power and ongoing oppression
- *Discursive relevance*: One of the most publicised lightning rods of national decolonial discourse
- *Transferability*: Implications apply to other colonial statues, as well as other colleges and sites connected to Rhodes
- *Mapping onto paper propositions*: This was my original case study for *Facets of Space*. I could have also used it for *Breaking the (Virtual) Chains*, but did not want to repeat the same site twice for prototyping.
- *Accessibility*: It is reasonably accessible, to be scanned from the other side of the High Street
- *Contextual data density*: There is a lot of contextual data on both the statue and the person it depicts, making this particularly suitable for *The Blue-Tooth Spectrum*
- *Repetition*: I chose this over the Rhodes Plaque and Rhodes House because it is more discursively prominent
- *Proximity*: This was my starting point which defined the parameters of proximity for the other sites



Figure 4: Illustration of the statue of Cecil J. Rhodes at Oriel College, Oxford.

Haida Helmet at the Pitt Rivers

Of the major Oxford museums, the Pitt Rivers Museum (PRM) was an obvious choice in terms of its relevance to national decolonial discourse (Hicks, 2020; Procter, 2020). A traditional Western collector's museum, the Pitt Rivers represents a struggle many similar institutions face: dealing with their histories of violence, looting, and displacing artefacts from their origin communities. The Pitt Rivers has been more active in critical self-reflection and involvement of origin communities than most UK institutions. The Museum's collaboration with curators, artists, and community members from Haida Gwaii in 2014 is of particular interest in this context because the Haida curators involved in that collaboration wrote a book, *This Is Our Life* (Krpmotich et al., 2014) on their experience. Additionally, the Cabinet project, an Oxford-based project to provide a virtual platform for teaching and learning with museum objects, developed an AR feature (with the PRM/in collaboration with curators at the PRM) which included several Haida artworks. Of these artworks, I chose the helmet, called 'the Octopus Helmet' on its museum label, because of its location in a crowded upstairs cabinet, which posed a good interactional challenge for Chapter 7's prototype, *Steal It Back*. The rationale behind choosing a much smaller-scale locality was to create a productive contrast between the three sites which would allow me to explore different forms of possible XR engagement.

- *Dimension of spatial coloniality*: Restitution and displaced artefact discourse
- *Discursive relevance*: Pitt Rivers is prominent in national discourse, Haida artefacts are held in museums all over Europe
- *Transferability*: Echoes the position of other displaced artefacts in Western museums
- *Mapping onto paper propositions*: Suitable for *Breaking the (Virtual) Chains*
- *Accessibility*: Publicly accessible for free, but only during opening hours; indoors.
- *Contextual data density*: This Is Our Life book, documentation on Pitt Rivers website about collaborations and decolonial work, The British Museums
- *Repetition*: I chose the Pitt Rivers over other Oxford museums because it has fostered more critical engagement with its colonial history
- *Proximity*: The Pitt Rivers Museum was my original prototype study for *Breaking the (Virtual) Chains* and thus the end of an imagined path between the sites

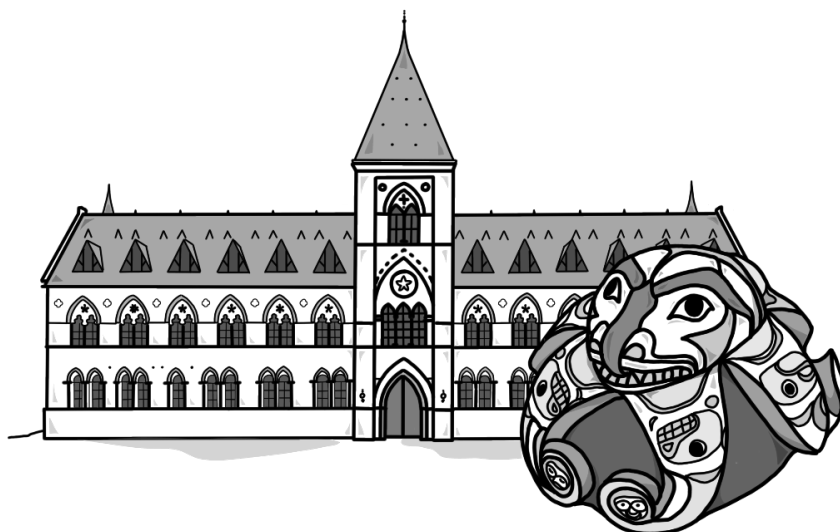


Figure 5: Illustration of the Haida 'Octopus' helmet, with the Natural History Museum (through which one enters the Pitt Rivers Museum) in Oxford in the background

Boundaries of Sites

What counts as a ‘site’ varies in spatial magnitude throughout this thesis. The Rhodes Statue is just one element – elevated high above the ground, towering over the entrance of Oriel College above several statues of kings and saints – of a building front which faces a busy street. The site for *Breaking the (Virtual) Chains* is not the building complex which houses the Natural History Museum and the Pitt Rivers Museum, but one object in the PRM. The spatial experience of the latter is necessarily tied to a larger context: as Cegys and Weijdom (2020) observe, an immersive experience does not start with the mediated experience, but when an experiencer takes off their shoes. While this is meant literally in their context of an indoor VR experience, they build on this metaphor as a moment of entering the experience, of leaning into hybridity. In AR experiences, this moment of removing one’s metaphorical shoes is less apparent: it could be taking out one’s phone, opening an app, looking at one’s environment through the AR interface of the app. While all sites presented in the prototype studies are contingent on seamless experiences of space, they are bounded by a narrative focus point. These focal points were selected with transferability in mind: a colonial statue, an institutional building which has been reappropriated repeatedly, and a contested artwork in a Western collector’s museum. Other sites could have told similar stories, and that is very much the point. At the end of each prototype study, I reflect on this element of transferability and how the site sits within a larger context of spatial interrelations.

Methods per Research Design Phase

This section introduces the methods each research phase in chronological order to provide an overview of how they complement each other throughout the thesis.

Research Design Phase 1: Spatial Analysis

Previous work

The taxonomy presented in *Facets of Space* is the result of several research stages: previous work, an iterative prototyping process, and a case study. ‘Previous work’, in this context, refers to learnings from research I previously conducted. This is a form of Self-Study (Pinnegar & Hamilton, 2009) which acknowledges a researcher’s practice and previous experiences as informing their research. In this case, my previous work stems from my MA research into sites of colonial history in London, as well as my work on a project called *Faulkner’s Barn* for VRELL (Virtual Reality Ethnography and Learning across Languages) (Salciute Civiliene, 2021). This work’s framing was based on the London Charter for Heritage Visualisation (Beacham et al., 2006), a research framework which sought to outline informational integrity standards for ‘research that includes computer-based visualisation’ in order to ‘accurately convey to users the status of the knowledge that they represent, such as distinctions between evidence and hypothesis, and between different levels of probability’ (p. 2). Despite its Western positionality, this agenda aligns with some decolonial efforts which aim to make visible the value structures which underpin academic works. Pointing towards the ambiguity of knowledge as well as the uncertainties of hypotheses and probabilities contributes to an approach to visual historiography which undermines a monolithic, Eurocentric version of canonical History. It acknowledges a researcher’s role beyond

their conservative conceptualisations as ‘mediums who contrive on others’ behalf to stand between the past and present, and through their own professional techniques and expertise reveal what had become obscured (but had always nonetheless been there)’ (Southgate 2014, p. 12).

Utilising the guidelines of the London Charter, I employed then employed a mix of research-through-design and a user feedback study into navigational mapping tools for AR applications based on Rehrl et al. (2014). This user feedback study consisted of semi-structured, in-depth interviews with 10 lay participants with the intention of working out some of the UX challenges of my MA project. In analysing this data, I realised that a structured approach to presenting information was crucial to how lay experiencers would critically engage with sites in AR. Simultaneously, working in a small research team at VRELL, I noted an absence of structured models for categorising spatial data which research teams could share and access. Analysing the challenges and needs of both of these scenarios, I outlined an initial version of the taxonomy, which formed the basis of *Facets of Space*, before beginning contextual research into existing approaches in the field.

Iterative Prototyping

In order to bring together the existing HCI literature on metadata management (Crystal, 2003; Davis et al., 2005; Weiland & Dachsel, 2008) with the practice-based gaps I had identified in relation to XR co-creation, I adopted Freeman and Curtis’ (2023) two-stage iterative process approach. They describe a study in which they led exploratory content co-design workshops in Phase 1 and reflexive prototype co-design workshops in Phase 2. My approach echoes this format through two phases with distinct objectives and participant pools. The first was a round of ten expert interviews to provide feedback on an initial draft of the taxonomy, the second a reflexive prototype focus group (Følstad, 2017).

Taxonomy I

Interviewing experts whose field of research relates to immersive technologies allowed me to speak to a potential target audience for the taxonomy, to probe its usefulness and practical applicability (Anastassova et al., 2007). One objective in involving potential target users in an early development stage of the taxonomy was to ensure that the voices represented in the contextual academic literature were not the only perspectives shaping this taxonomy. I recruited experts from a variety of professional backgrounds to ensure a level of diversity in user needs and potential applications (Bogner et al., 2009). Synchronous, semi-structured, one-on-one interviews allowed me to actively engage with individual responses and create a setting in which ‘the interviewee is an active participant and a source of knowledge’ (Foley, 2012, p. 306). Below is a breakdown of the interviewee’s respective areas of expertise and their suggested adjustments to the first iteration of the taxonomy.

Expert	Field of expertise	Suggested adjustments
1	3D Printing/3D Modelling practitioner	None (preference on material dimensions over self-reflexivity)
2	Historian	No need for content creation stratum
3	Architect	None
4	XR Artist	None
5	XR Teacher/Artist	Analogue version to be broken down into a worksheet with specific questions to use with students
6	Computer Scientist/HCI Researcher	None
7	Archaeologist	Expansion of material stratum
8	XR Researcher/Artist	None
9	Gaming Researcher	Full adaptation of ontology for in-game spatial analysis
10	Art historian	None

Table 1: Expert interviewees and their suggested adjustments to the conceptual taxonomy in Facets of Space.

Taxonomy II

I subsequently incorporated Phase 1 expert feedback into a digital version of the taxonomy. I tested this version with focus groups in two formats: one expert group using Google Docs and one university student group using Miro. Michael Muller (Rosenbaum et al., 2002) refers to focus groups as a ‘complementary’ and ‘converging’ method which can be utilised to lay ‘the groundwork for additional field research’ (p. 703). Following the individual, in-depth feedback from experts who interact with immersive technologies from different perspectives, the focus groups provided two new angles of insight. The first, consisting of an expert group of academics who work with XR in different capacities, was a more collectively oriented insight into potential user needs. For the student focus group, my analytical focus was less on the formal, and more on the collaborative aspects of the taxonomy. On Miro, a digital Whiteboard tool, I could directly observe the dynamics of how students navigated the taxonomy. This process, as well as the resulting taxonomy, are discussed in detail in *Facets of Space*.

Research Design Phase 2: Counterfactual Analysis

Rhodes Not Taken employs an original counterfactual analysis approach which, rather than following the more established contracting or expanding virtual history models (Ferguson, 2011), offers a deep dive into one locality. This analysis focuses on three dimensions: spatial, political, and monetary virtual histories, based on the critical discourse surrounding the Rhodes Statue at Oriel College, Oxford. This site is incorporated in two ways: first, as a counterfactual analysis case study, then as an XR prototype study. The first part focuses on a narrative deep dive covering 2024 to 1911, whereas the prototype in Part 2 presents a follow-up to these considerations. Spanning the same time period, the prototype is based on taking the paper’s virtual histories a step further, conjecturing what could have taken Rhodes’ place in the statue’s imagined absence. While the contextual background for the case

study of Rhodes is detailed in *Rhodes Not Taken*, the prototype study is an experimental addition which seeks to translate its findings into an immersive interaction.

Research Design Phase 3: Comparative Analysis

When Nicholas Frayne and I first met, his research (Frayne, 2021, 2023) presented a matching counterpart to my work: it investigates how XR can be used to create political memorials where there are none. At the time, my work, in contrast, investigated the potential of disappearing contested memorials through XR. We had both noted gaps in the existing literature of virtuality/reality taxonomies which failed to appropriately capture the complexities of contemporary XR creation. As a result, we conducted a comparative analysis of existing taxonomies based on Milgram and Kishino's (1995) seminal Reality-Virtuality continuum. This encompassed a critical discourse analysis and comparative literature analysis focusing on this particular model, resulting in a novel conceptual taxonomy which describes localities in both material and virtual capacities. Our focus was on providing an analytical tool which could capture what an environment does, rather than reducing it to binary notions of material 'realism'. Our approach is discussed in detail in Chapter 4, *The Blue-Tooth Spectrum*.

Research Design Phase 4: Critical Analysis

As a scholar coming from a critical theory background, the final conceptual phase of this thesis meant a methodological return to decolonial theory. I used Poka Laenui's (2006) *Processes of Decolonisation* as a critical lens to articulate the steps between activist intervention and material change. This practice-oriented critique draws on literature from Games Studies, activist strategies, and decolonial discourse to operationalise Laenui's phases for XR. This intentionally breaks with the Cultural Studies convention of keeping critique separate from practical applications, and draws into Games Studies literature a focus on communities affected by coloniality which is, while present in some of the literature, rarely put into dialogue with strategies from decolonial critique. In bridging these two approaches, *Breaking the (Virtual) Chains* seeks to contribute to a productive dialogue of how critical Games Studies and decolonial theory can nurture one another. XR is the medium through which I argue this dialogue can be facilitated, but I fully acknowledge that there are other media which may be equally suited to furthering this line of exchange. Chapter 7's prototype study provides a research-through-design approach which explores the intersection of decolonial activism and XR heritage interactions from a different angle than the integrated paper. However, both contributions complement each other as two possible approaches to this highly potent interdisciplinary intersection, fostering strategies for polyvocal co-productions of shared spaces.

Research Design Phase 5: Prototype Building

Prototyping as a way of thinking 'through' (Gilquin & McMichael, 2008) immersive technologies is a key component of the more experimental propositions this thesis makes. At different stages of the research process, I conceived of these contributions as one comprehensive prototype, at other stages, they appeared to be entirely separate endeavours which all demanded individual attention. Therefore, this process involved both iterative and

parallel prototyping (Dow et al., 2010), with the practical implementation informing conceptual development and vice versa.

Similar to my considerations on having one central case study, I ultimately decided that one prototype to combine all conceptual propositions presented in this thesis would create a misleading focus. It would have suggested that the core aim of this research was to develop a comprehensive app which reflects different aspects of decolonial thought and offers a variety of interactive engagements. It would have given a definitive character to a collection of contributions which, from my perspective, is antithetical to my intention of participating in an experimental practice which supports more diversity, polyvocality, and ambiguity. Creating one app would have risked turning this endeavour into an incomplete how-to guide of turning conceptual academic contributions into XR.

To me, it is a priority to underline that the XR prototypes which accompany Chapters 5, 6, and 7, are intended as starting points. As aforementioned, they are supposed to *communicate* and *explore*, rather than evaluate which research-to-XR translation is most effective. By providing three separate prototypes, this thesis presents a sample platter of possible iterations, rather than a definitive product. This aligns with how I view the core contributions of this research. The following sections detail the prototyping methods employed in the development of each prototype, in the order in which I carried them out, rather than in the order in which they appear in the thesis. As these practical experimentations built on one another, I found it important to retain their procedural order in this chapter.

Prototype Study: Rhodes Not Taken

Scanning

Initially I followed workflow proposed by Rahaman et al. (2019) (see Figure 6), using Regard3D to assemble two-dimensional images into a three-dimensional model. Rahaman et al. recommend this photogrammetry approach based on lay accessibility, as it uses regular photographs to create a point cloud. Subsequently, this point cloud is exported to Meshlab, which converts the point cloud into a mesh, which can then be exported into editing software like Blender, to then be transferred to Unity or Unreal. The reason I only used this approach initially is that the quality of the resulting 3D models was not very good, and the approach is – as stated as a limitation by Rahaman et al. – more suitable for smaller scans which allow for pictures to be taken from 360 degrees. For sites which are very large or inaccessible because of their position, like the Rhodes statue, one would need a high-quality camera to get detailed enough images and even then, getting enough angle variety may not be possible. The fact that the Rhodes statue is positioned high above a very busy street and faces North, putting the sun against

the camera lens during most hours of the day, further inhibited this approach.

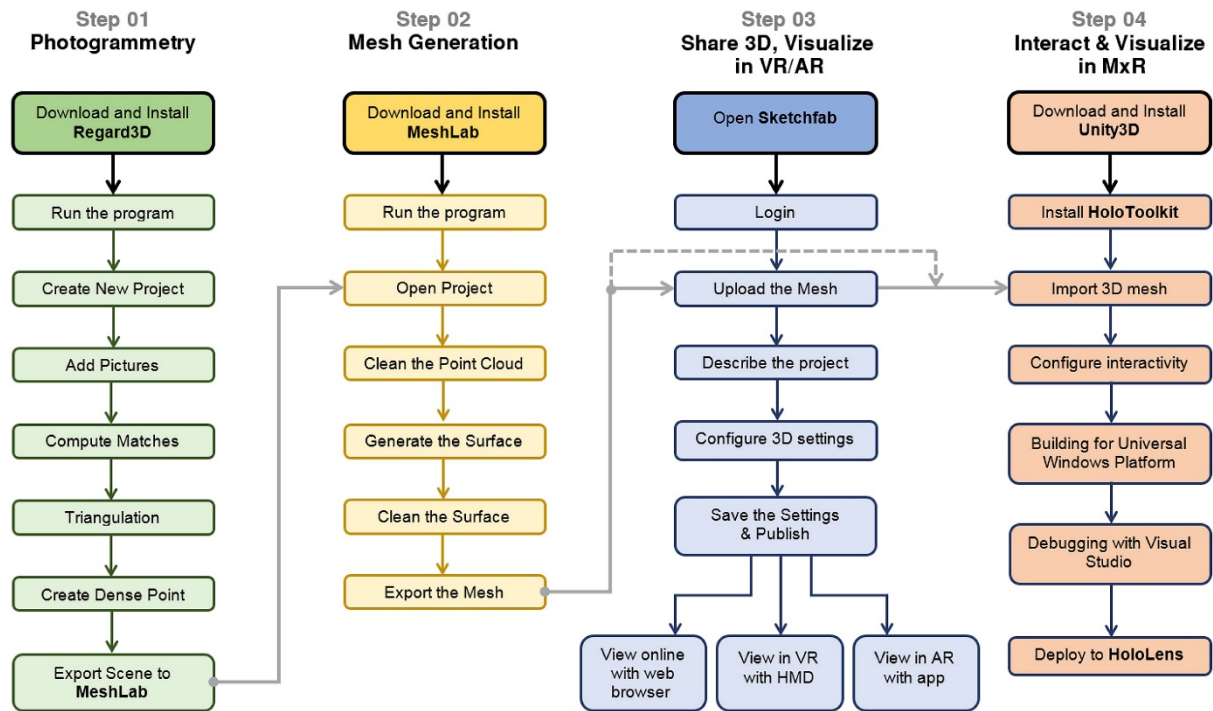


Figure 6: Workflow proposed by Rahaman et al (2019, p. 3) in 'From photo to 3D to mixed reality: A complete workflow for cultural heritage visualisation and experience'.

I experimented with other widely available tools such as LiDAR scans in Polycam as part of other site studies, but in relation to the Rhodes statue, they posed similar challenges to lay-accessible photogrammetry. Employing professional equipment or the use of drones would have countered my initial objective to utilise tools which would be accessible to lay users. While lay content co-creation ended up being less of a practical focus in later stages of developing these prototypes, they were central to my initial planning of this research. Before I wrote any of the papers presented in this thesis and entered the woodworks of actioning research-through-design, there was a possibility that the last quarter of my fieldwork would be comprised of user studies and testing. This would have taken my work onto a more education-focused path. While this a line of research inquiry with enormous potential, the practical logistics of lay 3D scanning, content creation, and moderation were never intended as the priority of this research. Therefore, I later decided to forgo a fully actualised AR prototype in favour of a conceptually fully developed, high-fidelity mock up.

Wireframing

I drew out each app interface on paper first, although some of the paper was digital. The purpose of these low-fidelity wireframes was to outline which frames were needed and what kind of composition would include all the necessary features. I then used Procreate and Adobe Photoshop to assemble and edit hi-fi wireframe images. In order to turn this wireframe into a functioning prototype, I used Figma to connect and animate the individual frames into a flow. This only encompassed the conceptual images, not the opening frames, T&Cs, etc., as the creation of a fully functioning app, as aforementioned, was not my focus.

3D Modelling

At the beginning of this research undertaking, it was my intention to fully actualise each prototype in AR, and user-test them consecutively. Therefore, I conducted a lot of research and experimentation into the most efficient workflows and tools, built countless models and scenes, and grew a grey hair or two over syntax errors in Python. However, neither of these experiments added significantly to the affordances of what hi-fi mock ups could represent as part of this thesis. This may be partially due to its format – I can, unfortunately, not link three-dimensional models in this document, or even provide QR codes which display an AR interaction on someone's mobile device. Therefore, all the work I poured into experimenting with these tools count towards my education as a researcher, 3D modeller, designer, and programmer, but in this thesis, it only plays a supporting role. I explored the advantages and disadvantages of using PyCharm with OpenCV, OpenGL, VPython, ARCore/ARKit, Vuforia, and CVZone for image recognition, object detection, motion tracking and depth estimation functions, respectively, and compared them to all-in-one solutions like MatterCraft. I evaluated MatterCraft against lower-skill applications like CoSpaces and TinkerCAD, and weighed higher-skill programmes like AutoCAD, Fusion360, Unity, and Unreal in terms of what would be the best possible way to translate my conceptual propositions into AR. I also explored options of embedding these AR interactions in existing spatial databanks like Niantic's dynamic 3D AR Map Lightship VPS or Magnopus' Connected Spaces. The 3D modeller in me did not want to accept that perhaps, a two-dimensional approach to prototyping was the most effective solution for an output in a two-dimensional medium. I mention this work in the background because even though it may not feature in every chapter of this thesis, this exploration and experimentation was a large part of my research process.

Prototype Study: Indian Institute

Wireframing

The process for the Indian Institute wireframe was very similar to that of Rhodes Not Taken, with a key difference in content. For this prototype, the challenge lay more in how the faceted folder approach could be translated into XR than the aesthetics of specific aesthetic choices. How information would be displayed and consumed was a core portion of this prototype development. Therefore, I developed several lo-fi prototypes which preceded the version which I put through the same process of Photoshop and Figma. Out of the three prototypes, this was certainly the one I spent most time on working out interface details in order to trace how an experiencer would access information, where this information would come from, and how sources would be embedded.

Prototype Study: Steal It Back

Scanning

For *Steal It Back*, I used an existing 3D scan of the Haida helmet from the Cabinet 3D scan repository. The existence and quality of this scan was partly why I chose the helmet as my prototype study to begin with.

Wireframing

I used the drawing programme Tayasui Sketches for the first *Steal It Back* wireframes and found that the level of abstraction drawn images provided was helpful for distinguishing between a sense of reflection and a sense of

reality within the XR experience. Michael Haller (2004) states that ‘greater abstraction engages the user’s senses and imagination’ (p. 189), but that it can also be operationalised as a symbolic barrier between two modes of thinking. In the context of *Steal It Back*, this was highly useful: in the application, experiencers are supposed to switch between critical reflection – which takes them ‘out’ of their embodied context in the museum – and interacting with their material environment in real time. Therefore, maintaining a visual distinction between (1) the reality of the artefacts in the museum as well as the reality of spaces where these artefacts could be returned to, and (2) the *Secondspace* of conceptual engagement with restitution challenges. This resulted in using a mix of drawing in Tayasui Sketches, the 3D model of the helmet in Cabinet, editing in Photoshop, and creating interactive paths in Figma to create this prototype. Because of the complexity of the decision paths, Figma was a central tool in this process – rather than coming into the interactive prototype with a fully formed path architecture, this development was iterative. As I was working out which questions to pose to potential users, questions emerged which I had not previously considered. Despite my own relative familiarity with restitution discourse, the process of developing this prototype was educational, as going down hypothetical paths of complication widened my perspective of what this app could – and should – include.

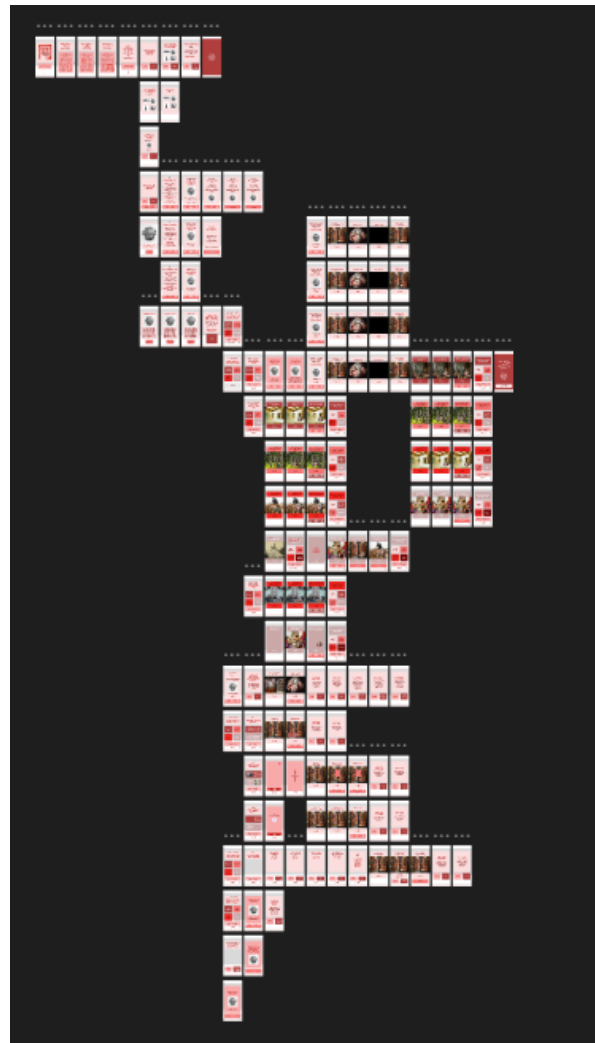


Figure 7: Decision tree for *Steal It Back* prototype.

Phase 7: Reflection

Reflection on the research questions, methods, findings, and cross-connections of the papers in this thesis went hand-in-hand with evaluating prototypes, self-reflection, and repeatedly reading my research against the decolonial underpinning upon which I embarked on this journey. This was not always a straight-forward process, and it rarely rendered unilateral answers to the emerging issues. Therefore, the Discussion chapter of this thesis reflects on the meta-level of conducting this research as part of an elite academic institution, against a backdrop of Eurocentric research conventions, and with a dual position in relation to working with, but also critiquing heritage practices. Below is an overview of the contributions which the Discussion reflects on:

Methods per Chapter

The below table provides an overview of each Chapter, its main research question, methods, contribution, and target audience.

Chapter	Research Questions	Methods	Contribution	Target Audience
Chapter 4	RQ 1: What are the gaps in existing conceptual XR taxonomies and how can we improve them to better position localities in space?	• Comparative Analysis • Conceptual Taxonomy • Research-through-design	• Insights into state of the art on reality/ virtuality taxonomies • New taxonomy to position localities in space	• XR researchers & practitioners • Architects • Designers
Chapter 5	RQ2: How can spatial (meta)data be organised in a structured, transferable, and transparent way to support the interdisciplinary and cross-industry exchange of data in XR interactions?	• Spatial Data Taxonomy • Case Study • Research-through-design • Prototype Study	• Insights into development process of a spatial data taxonomy • Transparent, transferable & structured tool to analyse spaces	• XR researchers & practitioners • Public historians • Interaction designers
Chapter 6	RQ3: How can spatial histories be re-narrated to make transparent the effects of Coloniality?	• Virtual History Analysis • Case Study • Research-through-design • Prototype Study	• Demonstrates potential of virtual histories for XR • In-depth insight into political, financial & spatial implications of case study site	• Heritage researchers & practitioners • Public historians • Activists
Chapter 7	RQ4: How can XR-facilitated activism support material change?	• Critical Analysis • Research-through-design • Prototype Study	• Strategic framework for aligning virtual interventions with material change • Material-impact centric prototype	• Activists • XR researchers & developers • Heritage institutions • Game designers

Table 2: Overview of chapters, research questions, methods, contributions, and target audiences.

Ethical Clearance

All practice-based research conducted as part of this thesis was approved by the Social Sciences and Humanities Inter-Divisional Research Ethics Committee (IDREC) under the ID SSH_OII_CIA_22_017. This research follows the Ethical Research Guidelines of the University of Oxford Social Sciences Division.

Limitations

There are at least three dimensions to the limitations of my research, outside of individual limitations of methods: one of site-specific work (1), one defined by the financial and temporal ramifications of this doctoral project (2), and one inherent to the technologies I am examining (3).

Site-Specificity

While the conceptual contributions of this thesis may be transferable to other localities, socio-cultural circumstances or differing enactments of spatial coloniality, the findings of the case studies are site-specific. My literature review highlights the historico-cultural specificity of spatial production and the inherent limitations of its analysis (Soja, 2010; Ramone, 2019). One apparent downside of an interpretative approach (Flynn, 2008) is its lack of a claim to positivist universality. While the latter would contrast my methodological orientation as rooted in decolonial theory and practice, I do acknowledge that my work is, in some ways, designed to undermine its own legitimacy. This is a common issue with decolonial efforts in Western academia (Lugones, 2010) but does, in my opinion, not weaken the possible impact this research could have within and outside of the ‘pluriversity’ (Grosfoguel, 2013).

University Context

Some of the ramifications inherent to obtaining a doctorate at the University of Oxford – such as producing a solo-authored output – as well as some of the copyright policies set out by the University have shaped this project into its current format, which is less collaborative than I had initially intended. This is, admittedly, also driven by my own priorities in terms of my learning experience and career orientation. Given the currently prevalent discussions on design justice in the app development community (Constanza-Chock, 2020), I view projects which demonstrate a replicable merging of well-reflected academic research methods and inclusive design solutions as vital. Therefore, I have prioritised the creation of a conceptual toolset over other possible research inquiries, such as advanced app user studies or community co-creation processes. My focus was on providing blueprints for critical engagement because the practicality of implementation is, at least from a perspective of decolonial critique, less of an obstacle. Working out technological kinks or running community-based workshops are infinite wells of iterative research, but in order to build on other researchers’ interdisciplinary contributions and operationalising them for decolonial activism, it is essential to develop a shared language, ask critical questions ‘through’ XR, and build accountability into gamified heritage experiences. In order to thoroughly investigate these aspects, I prioritised my conceptual work over user-testing applications or co-creating content.

Another limitation deriving from this project’s academic setting is that I am using case study sites which are located within an institution I am myself a part of. Hence, my motivation to be critical of the University of Oxford could potentially conflict with my own interests as a member of this institution. This is somewhat alleviated by the fact that I am not associated with or tied to either of the case study sites through my college or department, but I will reflect on this tension extensively in the Discussion regardless.

Technology

As part of a rapidly evolving field, XR literature has a very short half-life time. In December 2024, when this thesis was completed, some of the examples and references I worked with three years earlier were already

relatively dated. While this applies to many emerging technological fields, it is a limitation in the context of other academic disciplines, and other areas of social science research. While the political dimensions of my research have certainly experienced a contextual shift – when I started this work pre-2020, there was significantly less wide-spread public and academic interest in decolonial work – its core has remained unchanged throughout the process of this research. It is not inhibitive to my academic contributions that Laenui's *Processes of Decolonisation* were written almost twenty years ago, whereas most XR-focused literature (as Paper I demonstrates) loses some of its validity at a much faster rate. This is another reason why I have focused on conceptual contributions which are adaptable to technological advancements and changes.

Moreover, I have striven to angle my considerations towards both present and future uses of XR. Present limitations are very tangible: XR-specific devices (such as *HoloLens* or *Magic Leap* goggles) are too clunky for everyday use and too expensive for mass use; XR applications for mobile devices require a mobile device with enough processing power to run them, WiFi connection and language skills; XR visualisations are still restricted to a small pool of content creators and outputs vary dramatically in quality; rigorous academic research practices are not widely implemented in commercial XR content productions and their pedagogical potential is still on the cusp of reaching wide-spread use. Future limitations which are relevant to the orientation of my research are of more philosophical nature: because XR technologies do not materially change the environments they interact with, they risk, in the context of critically contextualising coloniality, that their impact may be performative rather than transformative, as discussed in *Breaking the (Virtual) Chains*. Throughout this thesis, I argue for XR's potential to change the way in which we collectively narrate the 'mythology of our environments' (Jacob, 2010). Whether this will lead to material change for those oppressed by systemic coloniality – or in Laenui's terms, to *Action* and *Commitment* – is outside of the scope of this thesis to answer.

Chapter 4: The Blue_Tooth Spectrum

CHAPTER 4

The Blue_Tooth Spectrum

RQ: What are the gaps in existing XR taxonomies and how can we improve them to better position localities in space?

Conceptual taxonomy

CHAPTER 5

Facets of Space

RQ: How can spatial (meta)data for XR be organised in a structured, transferable, and transparent way?

Conceptual taxonomy, Prototype Study



CHAPTER 6

Rhodes Not Taken

RQ: How can spatial histories be re-narrated to make transparent the effects of Coloniality?

Virtual History Analysis, Prototype Study

CHAPTER 7

Breaking the (Virtual) Chains

RQ: How can XR-facilitated activism support material change?

Critical Analysis, Prototype Study



To begin this journey of exploration, this chapter examines the foundations of how we orient ourselves in hybrid space. It contains the first integrated paper, which was co-authored with Nicholas Frayne, whose work focuses on spaces of violence and healing. As an architect working with XR, Nic brought a different set of disciplinary skills and knowledge to this research. Both of us encountered similar issues in our work when trying to accurately describe localities. Therefore, we joined forces in conducting an in-depth literature review into iterations of one of the most-cited concepts in HCI, Milgram and Kishino's (1995) Reality-Virtuality (RV) Continuum. The first surprise in this process was that the RV Continuum was intended as part of a more complex taxonomy, yet over the last three decades, this taxonomy has been mostly disregarded in favour of a simplified depiction of reality, virtuality, and the spaces in-between. As we investigated extensions and new iterations of the RV Continuum, however, we realised that a foundational issue was of semantic nature: placing 'reality' as one end point and 'virtuality' as another put them into an opposition with one another which we felt was not reflective of our experiences of hybrid spaces and our research thereof. In this paper, we discuss our considerations of why a reality-virtuality spectrum is not particularly useful for contemporary research, and propose a new conceptual taxonomy to position localities in hybrid space.

Mindful of how Milgram and Kishino's RV Continuum has been used in a simplified manner over the years, we sought to visualise our taxonomy, which we refer to as 'the Blue-Tooth Spectrum', as an easy-to-use tool. Rather than requiring a nuanced understanding of spatial dynamics, this taxonomy breaks down the question of *what a space does* into eleven axes which each capture a dimension of presence in hybrid space. Answering one axis at a time, the visual summary of the taxonomy gives an impression of where a locality lies on the Spectrum, and thus makes it easily comparable with other sites. The examples used in the paper itself correspond to the prototype study sites in Oxford, UK, which the other papers refer to, as a means of introducing these sites.

This contribution is intended for other XR researchers and practitioners, HCI researchers who focus on other technologies, designers, and architects. This paper is currently under review for publication. The distribution of our respective contributions as well as Nic's consent to this paper being included in this thesis can be found in the Appendix.

RQ1: What are the gaps in existing conceptual XR taxonomies and how can we improve them to better position localities in space?

Methods:

- Comparative Analysis
- Conceptual Taxonomy
- Research-through-design

Contributions:

- Insights into state of the art on reality/virtuality taxonomies
- New taxonomy to position localities in space

Target audience:

- HCI researchers
- XR researchers & practitioners
- Architects

The Blue_Tooth Spectrum

A Framework for Positioning Localities in XR Experiences

Abstract

Milgram and Kishino's reality-virtuality (RV) continuum (1994) has been seminal to the framing of XR (Extended Reality) research and development for the past three decades, leading to numerous adjustments, additions, and reframings. Building on this discourse, this paper proposes a theoretical taxonomy which positions localities in hybrid spaces. Its key critique of existing additions to the RV continuum is that they maintain a semantic and ontological separation of 'reality' and 'virtuality' which is not concordant with the contemporary hybrid realities of digitally suffused experiences. The proposed conceptual framework, collectively referred to as the 'Blue_Tooth Spectrum', accounts for eleven axes of positioning in hybrid spaces, including materiality, mobility, ambiguity, customisability, and interactivity. The spectrum is designed to centre experiences, rather than specific iterations of technologies, to maintain its validity as immersive technologies evolve. In doing so, this conceptual taxonomy is designed to capture the sociopolitical effects of XR experiences.

Introduction

In 1994, Milgram and Kishino published their seminal text *A Taxonomy of Mixed Reality Visual Displays* (Milgram et al., 1995a), which sought to outline the relationship between Augmented Reality (AR) and Virtual Reality (VR), as well as challenge the hardware limitations placed upon these technologies at the time. Their Reality-Virtuality (RV) continuum, which provided a novel definition of Mixed Reality (MR) was widely adopted into Human-Computer Interaction (HCI) discourse and remains a central point of reference in XR research. In this paper, we propose an alternative approach to categorising localities in hybrid spaces. Through eleven axes which cover various aspects of spatial experiences, we aim to centre the *experiencer* – users, co-creators, and interactors of XR encounters. Complimentary to existing additions to Milgram and Kishino's RV continuum, we aim to provide a categorisation tool which allows the positioning of any locality. This positioning, in turn, helps to account for the multiple effects that XR localities have on people's sociopolitical realities. Underlying this exploration is the conviction that XR experiences serve as a formative component in the production of the social sphere through which common action unfolds. The purpose of our theoretical framework is to account for the experiential effects of XR localities as they relate to the characteristics of the locality in hybrid space. This approach seeks to close the gap between existing framings of virtual interactions and the hybridity of presently available immersive technologies. By capturing where localities are positioned in relational space, this paper contributes to a deeper understanding of how XR experiences may be operatively understood, interacted with, and designed.

Background

While Milgram and Kishino's RV continuum has demonstrated admirable robustness throughout the past three decades, its representation of 'virtuality' and 'reality' as opposing poles of a spectrum is difficult to maintain in the hybrid present. Digital and material spaces now influence each other to a degree where one cannot be understood as a reality separate from the other (Zook & Graham, 2007). For instance, if someone is bullied in an online forum, this is *real*, despite the abuse occurring in a virtual space. Similarly, friendships forged through virtual avatars in MMORP games are a real part of people's social environments. In a post-COVID 19 world where an increasing amount of people is spending their workdays in virtual spaces, the assumption that only dynamics which play out in-person are *real* no longer applies. Yet, the notion that an analogue/digital divide can be clearly identified and defined prevails, as is exemplified by the continued popularity of the RV continuum.

Milgram and Kishino are not at fault in this respect: they presented their RV continuum as part of a more complex taxonomy which accounts for nuanced aspects of visually mediated experiences (Milgram et al., 1995a) at a time when hybrid spaces were not as ubiquitous as they are now. However, their taxonomy has not received much attention beyond the RV continuum (Skarbez et al., 2021), flattening its contribution into a digital immersion scale for XR projects. There have been numerous innovative adaptations and additions to the RV continuum, three of which have informed this paper.

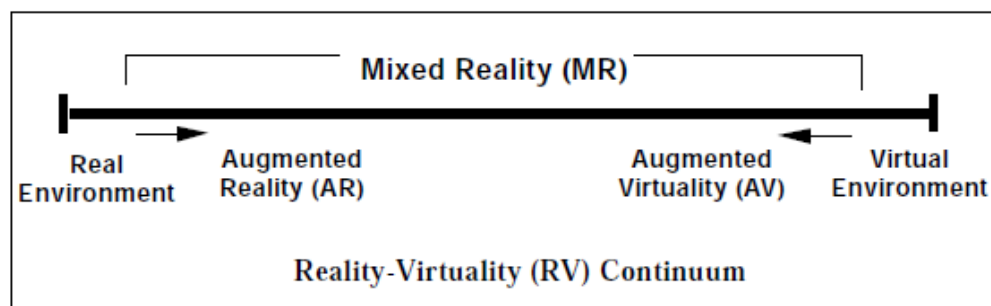


Figure 8: Simplified version of Milgram and Kishino's RV Continuum (image credit: Milgram & Kishino, 1995).

In 2005, Nijholt and Traum (Nijholt & Traum, 2005) introduced the perspective of the 'inhabited environment' to account for the interactions between digital and non-digital agents in hybrid space. They step beyond the technology-forward framework of Milgram and Kishino by arguing that relationships between participants in a virtual environment are social - they have real effects on the ways in which people define themselves with others. As part of this exploration, the authors argue for "multiparty interaction rather than models of traditional human-human or human-computer interaction" (p. 2133). This expansion of the RV Continuum is a major step towards blurring the 'real' and 'virtual' by situating computer-generated agents as social actors.

Where Nijholt and Traum articulate the 'reality' of the virtual, Stapleton and Davies (2011) argue that *imagination* – which they argue is not 'real' – is a powerful player in experiences of XR spaces. In 2011, they added imagination to the RV continuum as a third axis, with a focus on the experiencer over display technologies. Here, the "audience's imagination is an integral part of the narrative experience integrated within the physical and virtual worlds" (p. 57). Aside from their disregard of the 'reality' of imagination (which is strongly contested by scholarship on haunted heritage sites and more-than-human memory (Navaro et al., 2021), Stapleton and Davies

accurately identify that each experiencer brings with them ideas, memories, and discourses which are not ‘real’ in a material sense, but nonetheless frame their encounter within an XR experience. Accordingly, any XR experience is a balancing act between what experiencers bring with them, and what they are given by the space they enter.

A decade later, Skarbez et al. (2021) add to this line of critique that the original RV continuum’s focus on visual displays omits essential aspects of contemporary XR experiences. Further, they point out that the unattainability of the ‘virtuality’ end of the spectrum renders one of its limits outside of the scale. They draw on several frameworks which outline the boundaries between the material and the virtual (Barba et al., 2012; Koleva et al., n.d.; Lindeman & Noma, 2007; Mann et al., 2018; Normand et al., 2012; Speicher et al., 2019; Speiginer & MacIntyre, 2018) to propose an alternative taxonomy which takes into account Immersion, Extent of World Knowledge, and Coherence. However, like the key papers Skarbez et al. draw on, they do not challenge the central notion of the RV spectrum or its parameters. Instead, they focus on mapping how ‘mixed’ an experience is, and whether that experience is understood as distinct (i.e. ‘virtual’) from our normal lives, or as part of it (i.e. ‘real’). In this context, ‘virtual’ realms are not only measured against the ‘real’ world, but this yardstick is used to measure their impact, too.

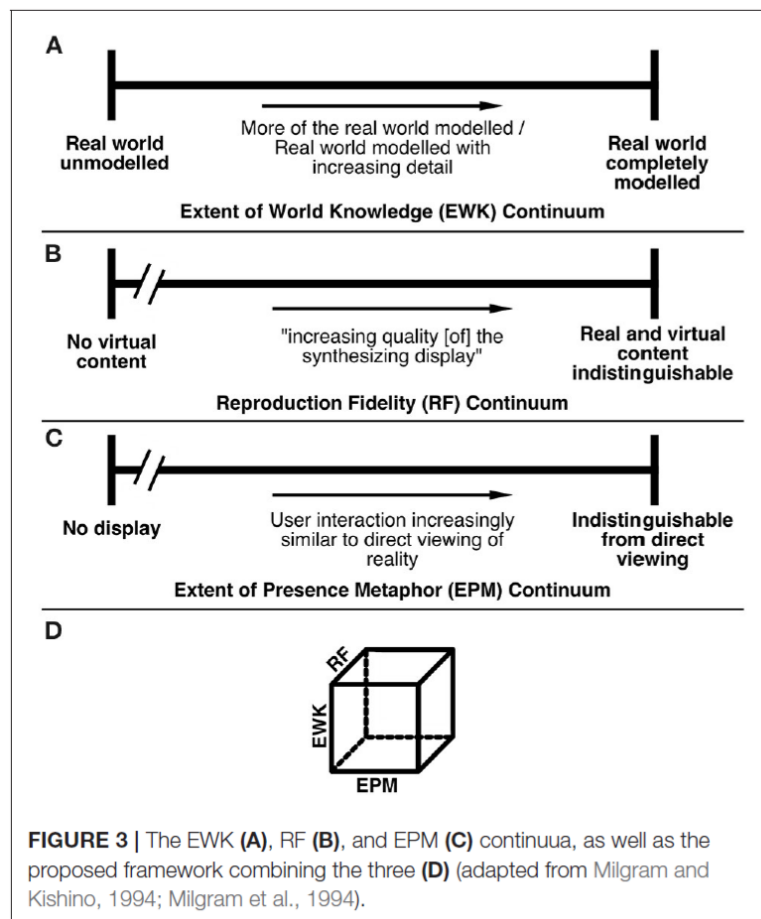


Figure 9: Skarbez et al.'s adjustments to Milgram and Kishino's RV Continuum (image credit: Skarbez et al., 2021).

In a present where the ‘real’ permeates the ‘virtual’ and vice versa, however, this framing of impacts in hybrid spaces is up for debate. While a conceptual framework which seeks to disentangle ‘real’ components from ‘virtual’ components is useful for assessing the extent to which a given technology is experienced as immersive, it is

unhelpful for understanding *what an environment does*. With increasing hybridity, the effects of hybrid spaces on experiencers' social, political, and cultural worlds necessitate attention. Taxonomies which capture the manifold ways in which localities are positioned within that space, how experiencers interact with them, and how these interactions are networked, are essential to understanding the impact which technologically mediated experiences exert in hybrid space.

The Blue_Tooth Spectrum

To address this gap, this paper proposes a conceptual taxonomy (Augstein & Neumayr, 2019) which positions localities in hybrid space. This non-hierarchical taxonomy consists of eleven continua, following Milgram and Kishino's format: Material/Immaterial, Authoritative/Co-Created, Single Narrative/Pluralistic, Single Iteration/Customisable, Absolute/Ambiguous, Isolated/Networked, Static/Mobile, Conservative/Innovative, Positive Space/Negative Space, Passive/Interactive, and Permanent/Ephemeral. Through these axes, this taxonomy an experiencer's direct relationship with a locality, rather than a person's experience relative to 'reality'. Thus, the assumption of a reality/virtuality distinction is replaced by the notion that all hybrid interactions are real, which means 'reality' does not feature as a qualifier in any of the continua. The proposes axes are not exhaustive, but intended as a starting point for other HCI researchers to adapt to their XR projects' needs.

This paper refers to the proposed collection of continua as the *Blue_Tooth Spectrum* because a blue tooth and the technology Bluetooth encapsulate the spectral extremes of the proposed continua under the same denominator: one being material, static, isolated, etc., and the other being immaterial, mobile, networked, etc. (See Figure 1). The following section outlines these eleven continua.

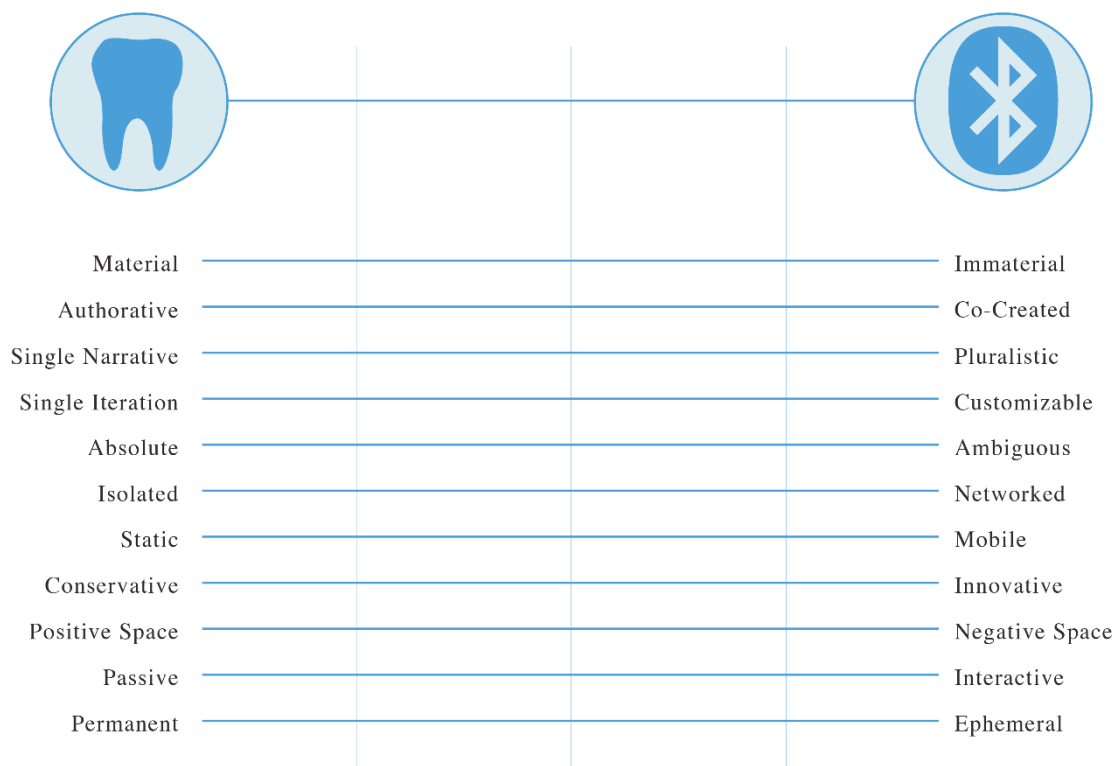


Figure 10: Overview of the Blue_Tooth Spectrum

Material / Immaterial

Unlike Milgram and Kishino's RV continuum, which presupposes a binary division between 'reality' and 'virtuality', the material/immaterial axis attends to the physicality of a given locality. Materiality refers specifically to the physical qualities which experiencers may encounter. This includes the material a locality is made from, its durability, specific formal features, size, and geo-physical rooting. Following literature across philosophy, cognitive archaeology, architecture, and heritage studies, these physical qualities mediate embodied experiences of localities and affect experiencers across the full range of our senses (A. Gordon, 2008; Malafouris, 2013; Merleau-Ponty, 2002; Pallasmaa, 2012). The immaterial, on the other hand, refers to non-tangible localities, such as those which exist only in digital or imaginative realms. These may be experienced through a mediating interface or imagination, but do not share the same fixed tangible format which material sites do.

Foregrounding a locality's materiality against its immateriality - rather than labelling these modes 'real' or 'virtual' - offers insight into the experiential mediation at hand, and the relationship a locality has to the wider hybrid world. This experiential mediation has social and political effects, as scholarship on the politics of emotions and the role of the body in social identity have established (Ahmed, 2006; Nussbaum, 2013).

Authorative / Co-created

While this paper acknowledges the confluent nature of productions of space (Harvey, 1973; Lefebvre, 1991; Massey, 1994; Soja, 1996), there are some spaces where solo-authorship is imposed more overtly than in others. These localities are *authorative* in the sense that the narrative perpetuated by them links to a single agenda and is framed as definitive. *Co-created* localities, in contrast, describe spaces which emerge from a multitude of influences which are all presented as equally valid within this space. While the effects of authoritative authorship are not always negative, highly authoritative modes of creation can become parochialising, setting fixed boundaries on which voices are valid and which are not, running the risk of delimiting horizons for critical interpretation of the experience at hand.

Single Narrative / Pluralistic

XR experiences carry narratives: choreographed, participatory stories which unfold as the experiencer encounters a locality in hybrid space. The structure of these locality-anchored narratives has significant influence on the experiencer's interpretation of content. A *single narrative* allows for limited options of experiencer engagement: there is an intended path and little to no deviation from it. This is a didactic experience, rather than a discursive or dialogical one. This can be useful in the context of combating harmful misinformation about a locality, as for instance evidenced in the 1990s Holocaust denial backlash. In this context, a single, incontestable narrative was needed to protect the cultural legacy of survivor memories. However, such incontestable narratives have featured across multiple forms of mass violence and are often mobilised by totalitarian regimes to garner uncritical support (Arendt, 1976; Waller, 2007).

Pluralistic narratives, in contrast, enable multiple unfolding experiences with potentially contrasting meanings and interpretations to be held and produced simultaneously. While single narratives prioritise clarity,

pluralistic narratives emphasise the overlaps between distinct experiences, offering a relational understanding to meaning making. Pluralistic narratives place the authorship of the locality in the hands of the experiencer and lean towards customisation and direct intervention into the space by the experiencer. This encourages active participation in a given space which can foster the formation of new communities beyond this locality. While the Single Narrative/Pluralistic axis tends to significantly interact with the Authoritative/Co-created axis, they do not necessarily move in set trajectories. A single narrative can be co-created and a pluralistic narrative can be authoritative in its context, which necessitates a distinction between these two axes.

Single Iteration/ Customisable

A *single iteration* locality, whether material or immaterial, is unique and fixed in its form. Any changes to the original are perceived as replicas or 2.0 versions, not a continuation of the same locality. A *customisable* locality, in contrast, is designed to be altered by experiencers and may not exist without such alterations. It is crucial to acknowledge that single iteration localities do change, whether through time or intervention, but these changes are not considered intended alterations. For instance, the interior of a car can be customised to its buyer's preferences, and spilling a coffee over the seats does not alter its intended customisability. This is even more prevalent with immaterial localities which allow indefinite changes, such as customisable gardens in video games. A bronze statue, on the other hand, is intended to exist in a specific iteration, and is not considered 'customised' by vandalism, even though this might alter its material appearance. The agency of the experiencer in defining the locality shapes their relationship with it, and potentially the sense of ownership they have. Thus, this axis captures the interplay of creator/experiencer agencies in a given locality, providing insight into the motivational context of an interaction.

Absolute / Ambiguous

Closely related to Single Narrative/Pluralistic, this axis focuses on the terms by which the story of a locality is communicated. Absolutism relates to the ability to question the authority of a given narrative: an unquestionable locality is *absolute* (Frayne, 2021). Ambiguity, in contrast, fosters critical thought and encourages the experiencer to create their own meanings from an encountered locality (Eco, 1989). *Ambiguity* can take the form of multiple contesting narratives that create an overall ambiguous encounter, or it can be an indeterminate experience where each encounter with the locality is different. An absolute locality resists questioning of its authority, while ambiguous localities enable it. This operates in two dimensions: as inherent to a locality (e.g. Churchill's journals which give insight into his attitudes at a given time) and as performed by the medium through which an experiencer encounters this locality (e.g. as in a virtual comment board which provides people's varying perspectives on Churchill's writings). While this axis interacts with Single Narrative/Pluralistic and Authoritative/Co-created, the options of intersection are varied: a narrative can be pluralistic and co-created whilst being absolute, another may be an authoritative single narrative, but ambiguous in sense that it invites critical questions (e.g. a didactic in a museum).

Isolated / Networked

Localities can be networked in both material and digital ways, but a unique affordance of digital technologies is that these interconnections can be made visible and generative (Jordan, 2009; Zook & Graham, 2007). Placing a locality along this axis from isolated to networked emphasises its interrelations with other localities. Isolation is understood from an experiential perspective in hybrid space: while every encounter with a given locality is preceded by a scaffold of other experiences, an *isolated* locality in hybrid space denotes a self-contained experience grounded in a single point of contact, with no contextual embedding. A *networked* locality, in contrast, allows for the experienter to connect a locality to relevant context and other localities, thus virtually moving between multiple localities within the same hybrid space. A key affordance of this axis is to draw attention to the networked connections embedded in both material and immaterial localities. While every locality can likely be considered networked in some way, the eponymous blue tooth and Bluetooth are an example of why this axis offers a useful scale. A blue tooth inside someone's mouth can be considered isolated - although one could argue that from a biological perspective, teeth are networked in their own way. In comparison to the wireless technology Bluetooth, however, which only exists because of digital networks, a blue tooth would sit on the far end of the isolated/networked axis. In conceptualising this framework, the authors mainly considered *networked* as relating to digital technologies, but depending on an XR project's needs, other forms of networks could be included in this axis.

Static / Mobile

A *static* locality is fixed to a geographical location or radius of access, whereas a *mobile* locality can move across material and virtual locations, and be accessed from multiple points. For instance, the Eiffel Tower is a static locality, but an 3D-printable digital model of the Eiffel Tower could be a mobile locality. In XR applications, both dimensions can be overlaid with one another, resulting in a dual positionality. An example of this is the popular AR app Pokémon Go, which provides a network of mobile interactions, but has locally static areas (e.g. specific gameplay only takes place in certain geographical locations). In this context, it must be acknowledged that concepts of staticness and mobility are perspectival, and become increasingly ambiguous the more abstract a locality is. What constitutes 'France', for instance, has changed significantly over time, yet France would still be considered as a static locality bound to a specific geographical area. In this paper, staticness and mobility are understood in current spatial, rather than historico-temporal terms, but adding a historiographical dimension to this axis could be a possible future extension.

Conservative / Innovative

This axis does not express a political stance embedded in a given locality, but rather its relational position to existing discourse. A *conservative* locality replicates established norms in its positional context (common building styles, traditional technologies, aesthetics, features, languages, etc.) whereas an *innovative* locality breaks with these norms (unorthodox material usage, disruptive technologies, appropriation, adaptation, etc.). While these choices can be political, the main objective of this axis is to identify where a locality sits within the surrounding geo-cultural discourse. Marita Sturken (2023) provides an example by contrasting the 9/11 Memorial in New York City with the National Memorial for Peace and Justice in Montgomery. While both memorial spaces use

contemporary aesthetics and eschew explicit narratives, the two spaces occupy radically different positions on US national identity as figured through terrorism. The 9/11 Memorial conserves a nationalist narrative in which terrorism is a threat from the outside, perpetrated on an ‘innocent’ nation. The National Memorial for Peace and Justice, also known as the ‘Lynching Memorial’ because it commemorates Black Americans murdered through terror lynching, breaks with this much-perpetuated idea of a benevolent nation by placing terrorism at the heart of American identity. Given that the racialised terror of the Jim Crow Era continues to affect contemporary life in the US (Alexander, 1914), this example demonstrates how the Conservative/Innovative Axis can help position a locality. Context and current reverberations are crucial to this consideration: the Eiffel Tower, for instance, would be positioned relatively far on the Innovative end of the spectrum because it broke with building traditions and was an architectural experiment of its time. Its contemporary symbolic use, however, does not reflect this initially Innovative position. Thus, where the Eiffel Tower would be positioned on the Innovative/Conservative Axis could vary between different projects and purposes of analysis. In a database which utilises the Blue_Tooth Spectrum, these varying positions could either be averaged out, or be presented as multiple-choice options for researchers to adapt to their specific project.

Positive Space / Negative Space

This axis characterises an experience of a locality through the architectural lens of interiority and exteriority. To be inside requires occupying a *positive space* – that which is enclosed. *Negative space*, in contrast, is always on the outside of a positive space. These two sides of the axis define each other, as one cannot exist without the other. To enter into a positive space is to actively immerse oneself in it, which is necessary for the experiencer to retroactively construct the encounter as meaningful (Pallasmaa, 2012). Negative space, on the other hand, is always an experience of exteriority, of being able to perceive a locality from a distance. This notion of positive and negative space necessitates placing limits on an experiencer’s relations with a locality. These limits shape how the design of XR environments mediates interactions. For example, a locality which affords an experience of interiority – such as the Forbidden City VR experience (Forbidden City VR, 2023) – has a threshold that is transgressed in entering it, offering a moment of experiential breakage. This break can be used as a narrative tool to organise the interrelations of the locality and its context. Forbidden City VR offers different limitations to an in-person visit to Beijing’s imperial palace complex, but also a range of different possibilities. A key affordance of considering the positive/negative space axis is identifying thresholds which may help shape the ways in which experiencers can engage with a locality spatially. In a database which takes this axis into account, researchers and creators could easily differentiate between localities which offer threshold-crossing opportunities for XR creation, and those which do not.

Passive / Interactive

A *passive* locality discourages interaction, be this through choice of material, avenues of access, size, design, or geographical location. An *interactive* locality may either encourage interaction, or be entirely brought into being by interaction. Similar to the Single Iteration/Customisable axis, a locality’s position on this axis is determined by its intended use. Oscar Wilde’s gravestone has arguably been appropriated into being interactive

by generations of fans leaving lipstick marks on it, but its original intention according to its socio-cultural context was passive. The Portals project (Portals, 2024) which connects the cities of Vilnius, Lithuania, and Lublin, Poland, through street-side interactive ‘portals’ which show a live feed from the other city, respectively, is an example of a locality created for interactivity. The 2017 art project *r/place* (Childs, 2022) is a non-material instance of an interactive locality. While the same could be said of community spaces within social media platforms, whether these count as distinctive localities is subject to interpretation. This paper works with a definition of locality as a definable site, as outlined above, and thus focuses on interactive localities which meet this criterion. However, this axis could be adapted to a wider definition of localities to encompass spaces which transcend these boundaries. Especially in the context of XR experiences linked to virtual communities and networked platforms, this could be a useful appropriation of this axis.

Permanent / Ephemeral

This axis overlaps with the Single Narrative/Pluralistic and the Absolute/Ambiguous axes. Permanence and ephemerality express the rate of change that a locality undergoes. This is intrinsically linked to the iterability of a locality, and the extent to which an experiencer may intervene in a space. An *ephemeral* locality can either change rapidly through time, or be designed to be temporary. A *permanent* locality persists through time, largely untouched by experiencers’ encounters with it. This can both be a precondition of an existing locality or a design choice in a novel creation process. A sense of permanence or ephemerality – such as ‘resetting’ between experiences, or user-created content additions – can fundamentally shape an experiencer’s relationship with a locality. A permanent locality resists experiencer authorship since it needs to remain consistent across time and across multiple experiencers. An ephemeral locality reflects experiencers’ encounters to each other across time, changing from encounter to encounter. While a permanent locality allows for a consistent frame of reference for multiple experiencers, an ephemeral one offers the potential for enhanced engagement by the experiencer through the act of affectively co-creating the locality with other experiencers. An example of a permanent locality would be the permanent exhibition at the Metropolitan Museum of Art in New York City, or its fully digitised online collection (Met, 2000). An ephemeral locality, for instance, would be an experiencer-oriented temporary installation like *Dear Visitor* (Schroeder et al., 2023), an AR experience to commemorate victims of sexual violence at Stanford University, or the co-produced multi-locality project *Inside Out* by artist JR (JR, 2011). The 1986 Gerz’ *Monument Against Fascism* is also an example of an ephemeral locality: experiencers were invited to inscribe statements on fascism in the 12-metre-tall metal column as it was lowered into the ground, eventually leaving its site empty. Despite its impermanence, the locality has remained present within cultural discourse, possibly due to its innovative counter-monumental approach.

Applying the Blue-Tooth Spectrum

To demonstrate how the Blue-Tooth Spectrum may be applied, this section will introduce three Oxford-based sites which are used in the other papers of the thesis: the former Indian Institute, the Rhodes statue at Oriel College, and a Haida helmet at the Pitt Rivers Museum.

The Indian Institute

The Indian Institute, now the Oxford Martin School, was built between 1882-1896 to house lecture halls, accommodation, offices, a museum and a library for scholars and students of Sanskrit and other India-related cultural studies endeavours. Funded by both British and Indian private investors, the Institute was supposed to foster bilateral research exchange. However, following personal feuds and a decline in popularity, the Institute was repurposed to house the History Faculty, central University Offices, and now, the Oxford Martin School for business. It falls on the left side of the spectrum (Figure 11) as material, absolute, static and permanent. Only its internal history pushes it to the middle in Single Narrative/Pluralistic, and as a building with both an inside and outside, it is comprised of both positive and negative space. The Indian Institute is relatively representative of buildings which have undergone several phases of use.

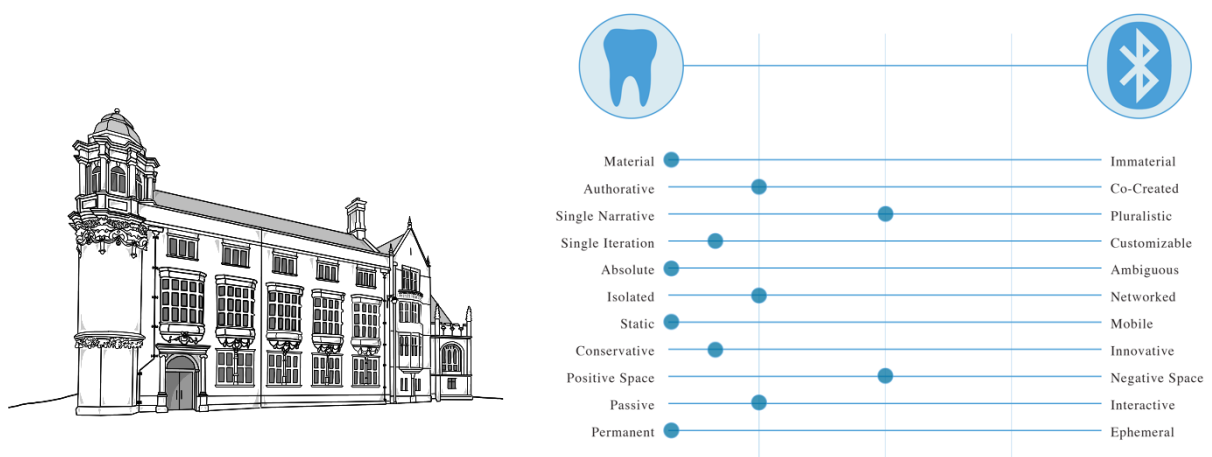


Figure 11: The former Indian Institute on the Blue-Tooth Spectrum

Statue of Cecil J. Rhodes at Oriel College

The first example is the statue of British Imperialist Cecil J. Rhodes (Figure 12) at Oriel College, Oxford, UK. Materially an unremarkable example of late 19th century sculptural traditions in England, the locality garnered significant cultural attention in 2015 and 2020, when the Rhodes Must Fall campaign and the Black Lives Matter protests, respectively, centred their local resistance around this site. The site continues to be subject of avid cultural debate around the legacies of colonialism in England. This example tends to the left side of the spectrum (Figure 2), presenting a locality which is material, static, and passive. Its position in a larger discourse which links it to other localities, and the fact that it has other iterations – such as the now-removed University of Cape Town Rhodes statue, made by the same sculptor – does not entirely position it at the extreme end of the spectrum, however. The Rhodes statue demonstrates where many traditional, material monuments would fall on the spectrum, but also underlines that contextual discourse matters in the positioning.

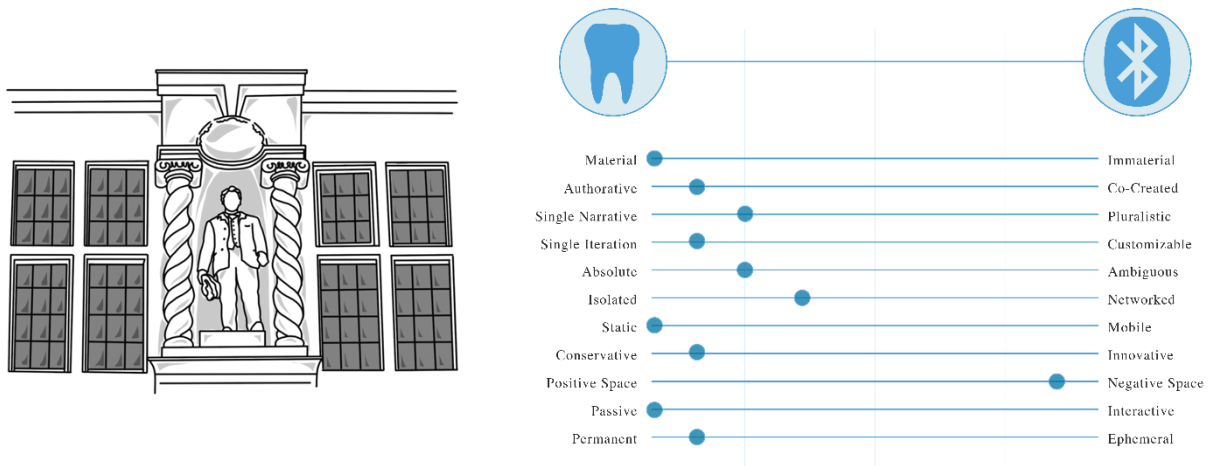


Figure 12: The Oxford Rhodes statue on the Blue Tooth Spectrum.

The Octopus Helmet at the Pitt Rivers Museum

The Octopus Helmet at the Pitt Rivers Museum is part of a collection of artworks from Haida Gwaii. Haida art has a significant presence in European ethnographic museums, an unusually traceable record of how artworks got to these museums, and an active community who are seeking to repatriate Haida art. The painted, wooden helmet is just one of these artworks and therefore represents a larger narrative of displaced art in Western cultural institutions. The helmet is positioned mostly on the left of the spectrum (Figure 5), as material, authorative, a single iteration, absolute and relatively permanent. However, it is also networked through its contextual embedding in the collective displacement of Haida artworks, relatively mobile, and can be interacted with, in its original intention, as a helmet. Therefore, the helmet is representative of many other museum artefacts of comparable size, value, history, and interactive use.

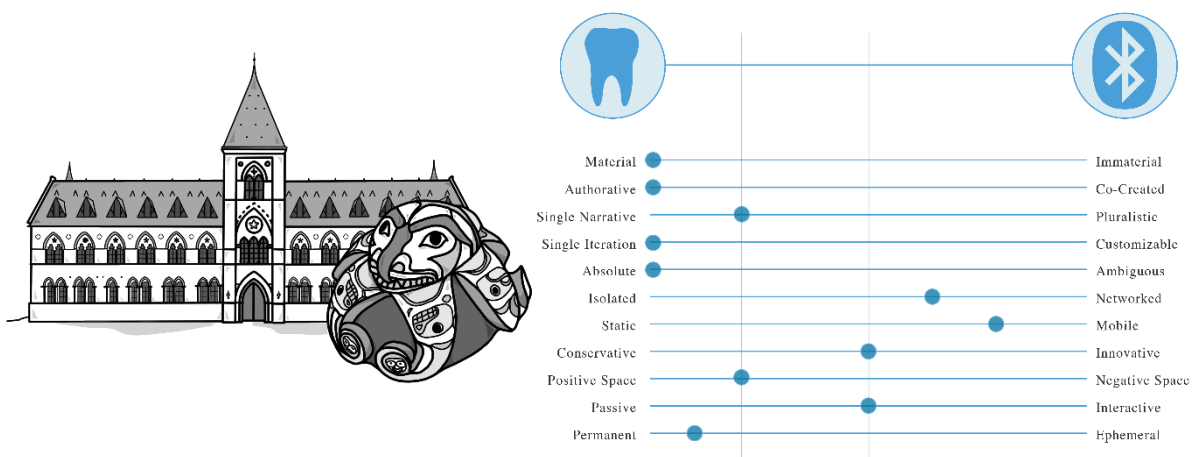


Figure 13: The Haida 'Octopus' helmet on the Blue Tooth Spectrum.

Further Applications

The given examples serve to illustrate how applying the Blue_Tooth spectrum allows for points of comparison for localities of different nature in hybrid space. Using this spectrum, researchers and XR creators can compare, log, and interpret localities as part of their process of analysing or creating XR experiences. The spectrum allows for multiple qualitative analyses of XR experiences to be brought together into a consistent dataset.

While this framework was conceptualised as a qualitative tool, in line with Milgram and Kishino's RV continuum, it could also be adapted into quantitative approaches. With sufficient data saturation, placements on the spectrum could be algorithmically automated and subsequently, those algorithms could be trained to incorporate other spatial databases. This could inform and expand existing metadata annotation in hybrid space. However, such an adaptation would have to address how the loss of individual interpretation and adjustment within a project would affect the quality of data, and whether there is sufficient analytical value in generalising this data.

Another, more practice-based potential application of the Blue_Tooth Spectrum is in XR creation: its components can be utilised to highlight links between multiple distinct localities, and take into account the complex experiential differences between them. Further, the spectrum can be a useful collaboration tool for XR creators working remotely or across different localities. Since the Blue_Tooth spectrum was developed as a conceptual extension of the discourse emerging from Milgram and Kishino's RV continuum, we acknowledge that in order to appropriately assess its practical applications for XR creation, extensive testing across a variety of practice-based projects would be necessary.

Conclusion

Following Milgram and Kishino's seminal RV continuum, this paper outlines an alternative conceptual taxonomy which attends to an updated understanding of the mutual implications of the 'real' in the 'virtual'. While previous taxonomies laid out the need to think through continua for working with XR experiences, they remained within the framing of the RV Continuum created in 1994. By prioritising experiencers over the technologies they encounter, the Blue_Tooth Spectrum offers an approach to positioning experiences and localities which is more reflective of the contemporary realities of hybrid spaces than previous taxonomies. This approach emphasises the effects of experiences on eleven axes: Material/Immaterial, Authoritative/Co-Created, Single Narrative/Pluralistic, Single Iteration/Customisable, Absolute/Ambiguous, Isolated/Networked, Static/Mobile, Conservative/Innovative, Positive Space/Negative Space, Passive/Interactive, and Permanent/Ephemeral. Each axis characterises a locality by *what it does* in relation to other localities. It highlights similarities, links, and unique components in a way that is applicable to any locality in hybrid space. Thereby, the Spectrum captures how multiple experiences and modes of acting relate to one another in hybrid space. While this approach may be applied to any spatial experience, the Blue_Tooth Spectrum particularly encourages contextualisations of XR experiences as active parts of the larger socio-political world which move beyond binary debates about how technologically 'real' or 'virtual' these experiences are.

Chapter 5: Facets of Space

CHAPTER 4

The Blue Tooth Spectrum

RQ: What are the gaps in existing XR taxonomies and how can we improve them to better position localities in space?

Conceptual taxonomy

CHAPTER 5

Facets of Space

RQ: How can spatial (meta)data for XR be organised in a structured, transferable, and transparent way?

Conceptual taxonomy, Prototype Study



CHAPTER 6

Rhodes Not Taken

RQ: How can spatial histories be re-narrated to make transparent the effects of Coloniality?

Virtual History Analysis, Prototype Study



CHAPTER 7

Breaking the (Virtual) Chains

RQ: How can XR-facilitated activism support material change?

Critical Analysis, Prototype Study



Utilising the *Blue_Tooth Spectrum* to position localities in space is a step to orient oneself, and to communicate to others the limitations and implications of a site. In order to foster critical engagement, however, merely situating a locality is insufficient. One needs to understand the given space and its embedded histories to critique, engage, and interact. This chapter offers a tool for this purpose: a conceptual taxonomy for spatial analysis. Like any rigorous spatial analysis structure (Archisoup, 2019), this taxonomy is tailored to a specific purpose – the creation of XR interactions – but can be adapted to other uses. The first part of this chapter, the second integrated paper, describes the process of developing this taxonomy, and details its dimensions. Of its nine strata, the first five can be applied to any space, irrespective of whether there is any involvement of immersive technologies: the environmental, material, architectural, habitational, and analytical strata. The following three strata – technological, content creation, and user – are more specifically tailored to XR creation, but can also be used for other digitally-mediated interventions to a space. The final stratum, positional, is a reflexive space in which researchers and practitioners can share their challenges, key takeaways and positionalities to help other researchers and practitioners working on the same site in the future. To demonstrate how each stratum of the taxonomy can be applied to a site, this paper provides examples relating to the former Indian Institute in Oxford, UK.

As this taxonomy is intended to analyse a site, for data organisation and reflection throughout a project, and to encourage knowledge exchange between different projects and teams engaging with the same site, it has a wide range of disciplinary use cases. Because it is conceptually based in HCI metadata management literature, its main intended audience are HCI researchers, XR researchers and practitioners, and designers. However, as the iterative research-through-design process in this paper describes, this taxonomy can be used for a variety of applications.

RQ2: How can spatial (meta)data be organised in a structured, transferable, and transparent way to support the interdisciplinary and cross-industry exchange of data in XR interactions?

Methods:

- Conceptual Taxonomy
- Case Study
- Research-through-design
- Prototype Study

Contributions:

- Insights into development process of a spatial data taxonomy
- Transparent, transferable & structured tool to analyse and annotate spaces
- Iterative prototype which demonstrates how this taxonomy can be applied

Target audience:

- HCI researchers
- Public historians
- XR researchers & practitioners
- Interaction designers



Facets of Space

A Taxonomy for Spatial Data

Abstract

As our physical environments become increasingly entrenched in digital data, the ways in which we annotate, construct, and contextualise spaces through data grow more complex. A wealth of interdisciplinary research engages with these complexities, but thus far, there are few structured approaches which actively foster the exchange of data between projects, disciplines, and thematically related work. This paper proposes a taxonomy which promotes a structured, transferable, and transparent organisation of spatial (meta)data. Aimed at XR (immersive technologies) innovation, this paper suggests nine spatial strata [*environmental, material, architectural, habitational, analytical, technological, content creation, user, positional*] which may be adapted based on the specific needs of a locality, application, or project. Thereby, it seeks to provide a structural basis for interdisciplinary and cross-industry data exchange in the creation, analysis, and implementation of XR interactions.

Background

As our material environments become more suffused with digital data, longstanding interdisciplinary concerns of how we manage and categorise metadata in databases are becoming more spatial. The adaptation of immersive technologies (XR) into mass-market media has substantially contributed to this development. From Zoom background effects during lockdown, to virtual classrooms, interactive TikTok filters, and a booming XR gaming market: exposure to XR interactions is becoming increasingly prevalent. A particularly relevant example is Google Maps, which for decades has been a digital extension of physical, 2-dimensional mapping traditions. More than analogue maps, however, Google Maps shapes material environments through its selection, information management, and code (Graham & Zook, 2013). In 2019, they launched their AR-based Live View functions (Thi Minh Tran & Parker, 2020), in which users, rather than looking at a map from a birds-eye view, see their route overlaid onto their 3D environment through the device camera, and are provided with spatial annotations, such as house numbers or site names. While this is an extension of existing tied in features such as Street View, Live View changes the interactive modalities of Google Maps.

Any form of mapping is a translation, but the 4-dimensional re-insertion of digital data into physical environments marks a moment of spatial double-translation. First, a material environment is abstracted into a map, digitised, catalogued, translated into metadata. Then, this data is visually re-applied to a virtually augmented 4D space, merging digital information and in situ space. The same principle applies for other AR applications, but Google Maps, the most-used mobile app worldwide (*Google Maps Usage Statistics*, 2023), is likely to be one of the most influential drivers of incorporating AR into people's day-to-day experiences. How these translations are conducted – who is selecting and editing data, what is being made accessible to users, and whose interests are being represented – has long been a concern of critical theorists, geographers, and HCI researchers alike (Burney

et al., 2017; Crystal, 2003; Dumais, 2018; English et al., 2002; Feinberg, 2012; Feinberg et al., 2014; Luque-Ayala & Neves Maia, 2019; Odom & Duel, 2018; Redmiles et al., 2017; Shaw & Graham, 2017; Star & Bowker, 2007; Yee et al., 2003).

In HCI research, critical engagement with metadata management systems has a substantial history outside of mapping applications. In the early 2000s, Abe Crystal (2003) raised concerns about how metadata is mediated, and voiced the need for decentralised metadata creation. At the time, metadata was defined as structured ‘data about data’ which facilitates functions such as search discovery (Greenberg, 2003). Within this definition, metadata may be *faceted* (organised by themes, time periods, media, geographical locations, etc.) (Dumais, 2018; English et al., 2002), *flat* or *hierarchical* (‘by Banksy’ or ‘located in Bristol > England > United Kingdom’), and *single-valued* or *multi-valued* (data allows either one value to be assigned, or multiple). These parameters were outlined by Yee et al. (2003) to test effective metadata labelling for searches in image databases. Yee et al. called for future research on adding personalisation, history, and relevance feedback to their metadata interface functions. Applying this to AR is especially complex because there are data points which are embedded in (1) the histories of physical spaces, (2) the affordances of the technologies employed, and (3) the agencies of the people involved in the experience, from app creator to end user. Therefore, the question emerges of whether we need a different definition of ‘metadata’ as data that is spatially embedded, and whether this spatial metadata requires different forms of organisational considerations.

Despite decades of fruitful research into the complexities of metadata organisation (Feinberg, 2012; Mazé & Redström, 2005; Odom & Duel, 2018; Star & Bowker, 2007), there is currently no taxonomy which addresses these challenges. Maddali and Lazar (2023) assess that ‘there is a missing understanding of how designers can translate the social context of real physical objects to their virtual representations and how this translation might affect user experience’ (p. 1). This follows a wealth of practice-based XR explorations within HCI, from Rocha and Lopes’ (2020) considerations on how AR may increase spatial accessibility, to virtual tourism projects (Wolf et al., 2023) and politically motivated initiatives (Maddali & Lazar, 2023; Sabie et al., 2023; Schroeder et al., 2023). In these projects, the spatial double-translation of information impacts user interfaces, interactivity, and aesthetics on the front-end, and metadata management, content selection, and information architecture at the back end. Thus, there is a wealth of information to be learned from how these projects analyse, remediate, and moderate spatial data. However, the interdisciplinary nature of XR research makes comparisons and informational exchange challenging (Rahaman et al., 2019). Therefore, this paper proposes a conceptual taxonomy with two core contributions.

Firstly, it provides a transparent, adaptable blueprint for XR researchers to (a) improve and structure their in-project workflows, (b) communicate their experiences more easily to their peers, and (c) make this information more accessible to XR practitioners outside of academia. Secondly, it encourages thinking beyond the current distribution of spatial content creation. As the web moves increasingly towards user-generated content (Alvarado Garcia et al., 2023; Li et al., 2023; Petterson et al., 2023), it is essential to consider which organisational structures may support lay content creation in XR. Hypothetically, spatial annotations in mapping tools could function on a wiki-basis, allowing local users to contribute information about environments they inhabit or interact with. However, based on how Google Maps and comparable apps currently operate, it seems more likely that AI engines will draw on existing information hierarchies, thus proliferating current power distributions in digital information

(Dezsö et al., 2006; Goldsmith, 2007; Shahrokni, 2015). As a result, information siloes (Shahrokni, 2015) may further narrow and skew the perspectives people are presented with (Krafft & Donovan, 2020). In this early stage of the spatial Web, however, there is still potential for alternative paths: diverse information sources and inclusive design systems are still a possibility.

This requires designing organisational structures, databases, and (meta)data management approaches which move towards different forms of information sourcing and content moderation (Jørgensen & Jenkins, 2023). That means combining AI-driven data inputs (Gobbo et al., 2022) with qualitative information which is created by and for a community. Simultaneously, we need to reassess what we count as metadata, especially in the context of spatial metadata. Locations, altitudes, street names and other descriptive markers do not automatically encourage critical engagement or adequately cultural contextualise a site. Finding a picture in one's grandparents' attic can be the beginning of a journey of new meaning making, as can a school project, a local architecture commemoration grant, a dyslexia-friendly community initiative – and XR provides a thus far unique opportunity to bring these different perspectives into dialogue with one another, to consider them additively and spatially. This taxonomy is intended as a tool to facilitate this form of dialogue.

Approach

Framing

To understand the complexities of spatial data, it is useful to consider space as relational. This notion of our material environments does not treat space as a container to be filled, but as an amalgamation of collective co-productions which is in constant flux (Harvey, 2009b; Jacob, 2012; Lefebvre et al., 2013). Applied to XR, relational notions of space provide a flexibility and fluidity which suits this transient medium well. Rather than reducing spatial data to that which can be heard or seen, a relational understanding of space allows for the inclusion of historical data, layers of spatial alterations, and differing interpretations of these materialities as *part of* space. It invites the recognition of multiple interpretations and perspectives as integral to space. XR does not add this data, it merely makes it visible.

This is particularly relevant when considering who or what has historically been omitted, silenced, or not recognised in a space. A relational understanding of space positions these perspectives as a constitutive part of our shared environments, not a retroactive alteration. This is essential, especially in the context of historical discourse: just because information is new to the person receiving the information does not mean this is new information, or that it is less legitimate. Source transparency and context can help position this information, and make it easier for the person receiving the information to place it in their perspectival context. Structured categories can aid this process, whilst simultaneously preventing information overload. As several studies regarding metadata tagging in other digital realms have demonstrated, a perceived excess of information can be detrimental to users' willingness to engage with a network of metadata (Cherubini et al., 2010; Forte et al., 2014; Jones et al., 2001). Accordingly, information stratification is key to a user-generated content contribution model. However, any categorisation system is bound to create new omissions. An effective taxonomy must account for these omissions (Forte et al., 2014). It should 'incorporate ambiguity, open-endedness, contradiction, and plurality' and focus on *experience* (Feinberg et al., 2014). In the case of XR, this means centring embodied

interaction and the affordances only a 4D medium provides.

Methods

The development of this taxonomy began with trialling Weiland and Dachsel's (2008) *Faceted Folders System* by adapting their user-oriented organisational approach to XR. In the early stages of building a categorisation system, Jackson *et al.* (A. Jackson et al., 2016) recommend considering how search results in a future database could be organised. Thus, this taxonomy understands its parameters as *seamful*. Seamfulness is a strategy which, according to Chalmers et al. (Chalmers et al., 2004), moves beyond the accommodation of uncertainties, errors, and technical glitches to an approach which enables its users to take advantage of these seams and appropriate them according to their needs. Thus, the proposed strata may be expanded, changed, and adapted depending on a project's needs. In fact, stepping outside of their delineations is encouraged. Whether this might serve to accentuate definitional shortcomings or counter established categorisation paradigms with the intention of undermining exclusionist biases, as suggested by Clarke and Schoonmaker (2020), this taxonomy is designed to be challenged.

In its current form, this taxonomy emerged from two main research stages: drawing on previous work and an iterative prototyping process. This previous work included an HCI user feedback study (Rehrl et al., 2014) I conducted in 2020 (Figure 14) which analysed a selection of sites in London that are linked to historical data in the National Archives collection *Black Presence: Asian and Black History in Britain, 1500-1850* (Figure 15) (Mackenthun, 2020). In this study, ten participants were presented with an interactive prototype of AR content relating to the sites. They provided feedback in the form of in-depth, semi-structured interviews during and after a self-directed walk-through (Light et al., 2018). One section of this feedback focused on information which participants considered essential to critically contextualise a given site. Based on a thematic analysis of this feedback, four categories emerged: *environmental* – information about geographical location and weather conditions; *architectural* – information about the site's building history; *habitational* – information about the site's use and adaptation, and *analytical* – traceable sources for the information provided through AR.



Figure 14. Left: Lloyds of London/East India Company Headquarters, right: Nelson's Column in Trafalgar Square.

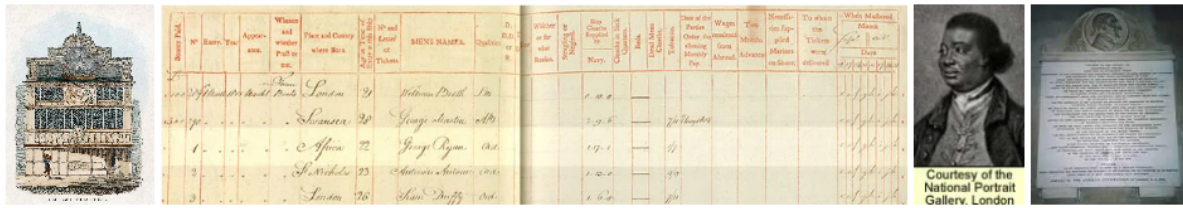


Figure 15. Examples of archival materials included in the Black Presence collection (image credits: British Library).

Parallel to this research, I was working on a VR ethnography project called *Faulkner's Barn* (Salciute Civiliene, 2021) as part of a small research team at VRELL (Virtual Reality Ethnography across Literature and Languages). Within the team, which collaborated remotely because of COVID-19 we used an informal rubric to exchange information about different spatial data components. I noted an absence of structured models for categorising spatial data which research teams could share and access. In order to bring together existing HCI metadata management approaches and the challenges inherent to spatial data in XR co-creation, I adopted Freeman and Curtis' (2023) two-stage iterative process to formulate the first iteration of this taxonomy.

Iterative Prototyping

Freeman and Curtis' (2023) describe a study in which they led exploratory content co-design workshops in Phase 1 and reflexive prototype co-design workshops in Phase 2. My approach echoes this format through two phases with distinct objectives and participant pools. The first was a round of ten expert interviews to provide feedback on an initial draft of the taxonomy, the second a reflexive prototype focus group (Følstad, 2017).

Taxonomy I

The draft I presented to experts in the first round of interviews had four more dimensions, based on the needs we had as a co-creation team at VRELL: content creation – motivations and processes behind the design, editing, and implementation of an XR interaction; technological – limitations of technological affordances on a particular site or project; and users – information about how users interact with a given application. Including these as a deductive addition made this interview round somewhat experimental. One of my objectives was to probe whether the strata which seemed useful for a VR co-creation team would translate to other teams and contexts. Interviewing experts whose field of research relates to immersive technologies allowed me to speak to a potential target audience for the taxonomy, to probe its usefulness and practical applicability (Anastassova et al., 2007). I recruited experts from a variety of professional backgrounds to ensure a level of diversity in user needs and potential applications (Bogner et al., 2009). Below is a breakdown of the interviewee's respective areas of expertise and their suggested adjustments to the first iteration of the taxonomy.

Expert	Field of expertise	Suggested adjustments
1	3D Printing/3D Modelling practitioner	None (preference on material dimensions over self-reflexivity)
2	Historian	No need for content creation stratum
3	Architect	None
4	XR Artist	None
5	XR Teacher/Artist	Analogue version to be broken down into a worksheet with specific questions to use with students
6	Computer Scientist/HCI Researcher	None
7	Archaeologist	Expansion of material stratum
8	XR Researcher/Artist	None
9	Gaming Researcher	Full adaptation of ontology for in-game spatial analysis
10	Art historian	None

Table 3: Table overview of expert interviewees' fields of expertise and their suggestions for adjustments to the taxonomy.

The changes suggested by interviewees were relatively minor according to their respective practice. All of them were able to adjust the taxonomy according to the work examples they provided in the interviews. Their feedback enriched the taxonomy draft and further defined and expanded what each stratum could encompass. One addition was made in this phase, based on feedback from the Art Historian and Games Researcher, specifically: *material* – information about the materials which constitute a physical space (incl. political, cultural, or spiritual factors). In the decolonial context of my work, this stratum morphed into a different dimension than what these two experts had originally outlined, but their contributions are still contained in the current version of the taxonomy.

Taxonomy II

I tested Taxonomy I with focus groups in two formats: one expert group using Google Docs (Figure 16) and a university student group using Miro (Figures 17 and 18). The first, consisting of an expert group of academics who work with XR in different capacities and act as multipliers in their respective work environments (e.g. teaching, project leads, team leads in heritage institutions), was a more collectively oriented insight into potential user needs. For the university student focus group, my analytical focus was less on the formal, and more on the collaborative aspects of the taxonomy. This focus group consisted of two groups of university students aged 19-45, 12 participants in the first group and 15 in the second. The majority of participants were undergraduate students in Digital Humanities related subjects, the other 6 participants were graduate students in heritage-related subjects. All participants were based at UK universities and attended the focus group meeting in person. I provided them with a site to analyse (Somerset House in London), explained the strata of the taxonomy and encouraged them to

be as efficient as possible (e.g. by forming research groups to split tasks). On Miro, a digital Whiteboard tool, I could directly observe the dynamics of how students navigated the taxonomy while their individual contributions were pseudomised. The spatial configuration of a shared board in the student group vs. a shared document for the expert group was significant, as was the ease of incorporating interactive elements such as GIFs in Miro. In both focus group sessions, participants provided oral feedback. In the expert session, there was the additional option to leave notes and comments in the document.

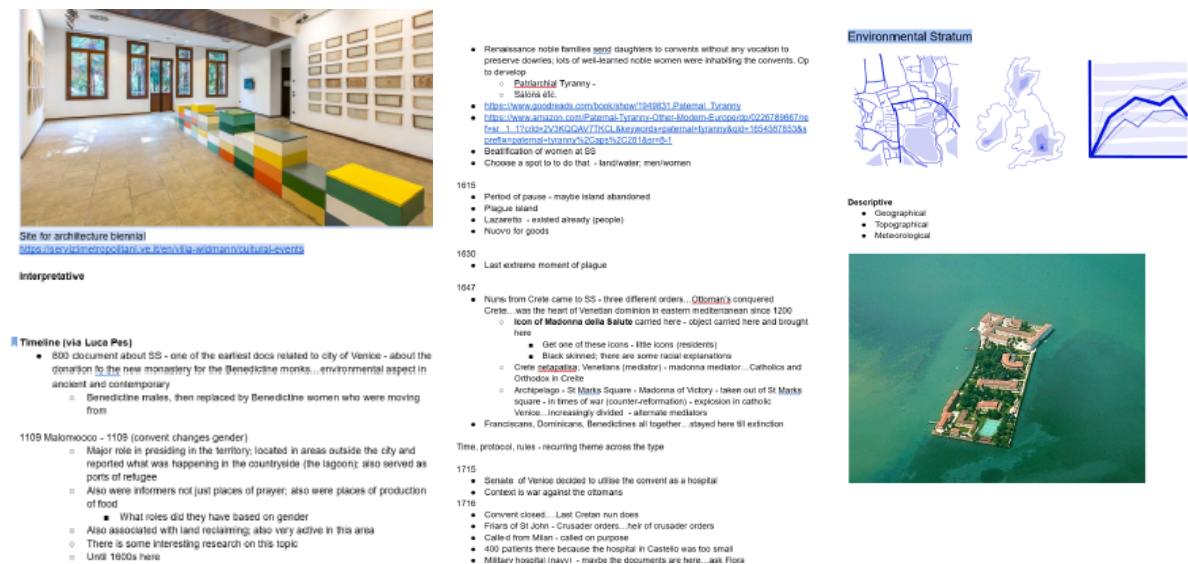


Figure 16: Google Doc working document used by heritage experts in Focus Group 1.

Main points of feedback from the heritage professionals focus group were that the taxonomy was a helpful toolkit for them, but could be improved in the following ways:

- 1) providing prompts in the interpretative section to motivate users to utilise them more and distinguish between descriptive and interpretative
- 2) adding a temporal mode which allows to distinguish between what has been done and what could be done in a space
- 3) providing a dialogue-based version of this, e.g. an AI chat bot which alternates between posing prompts, asking questions and sorting input information
- 4) create a version of the taxonomy which is specifically for projects which are not site-specific

Following this focus group's discussion, I added another stratum to enable the inclusion of meta-level reflection for collaborative teams: *positional* – reflection on the researchers' or practitioners' motivations, restrictions, and expertise.

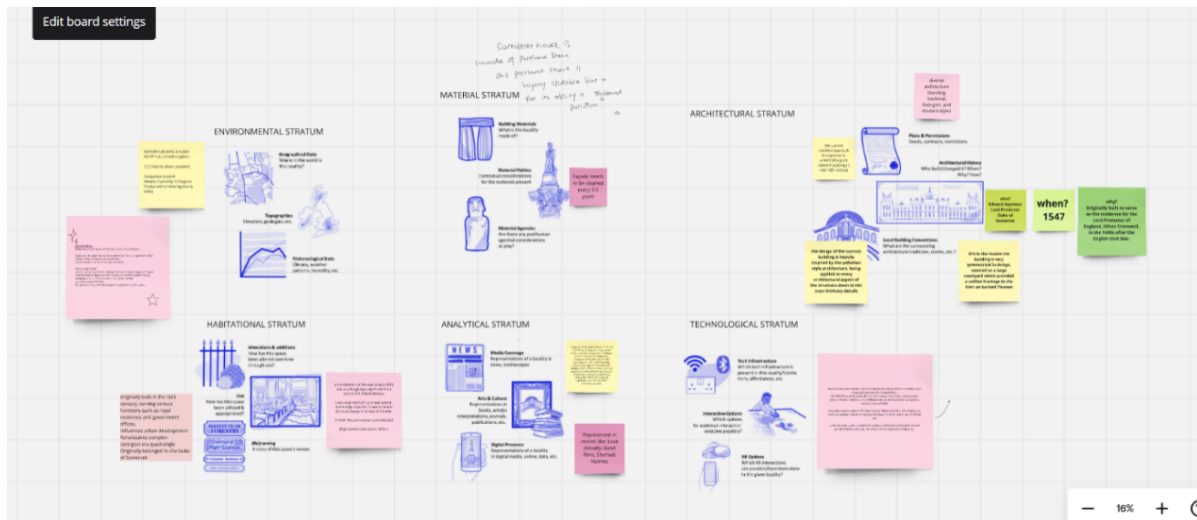


Figure 17: Focus Group 2.1 – Miro board used by university students

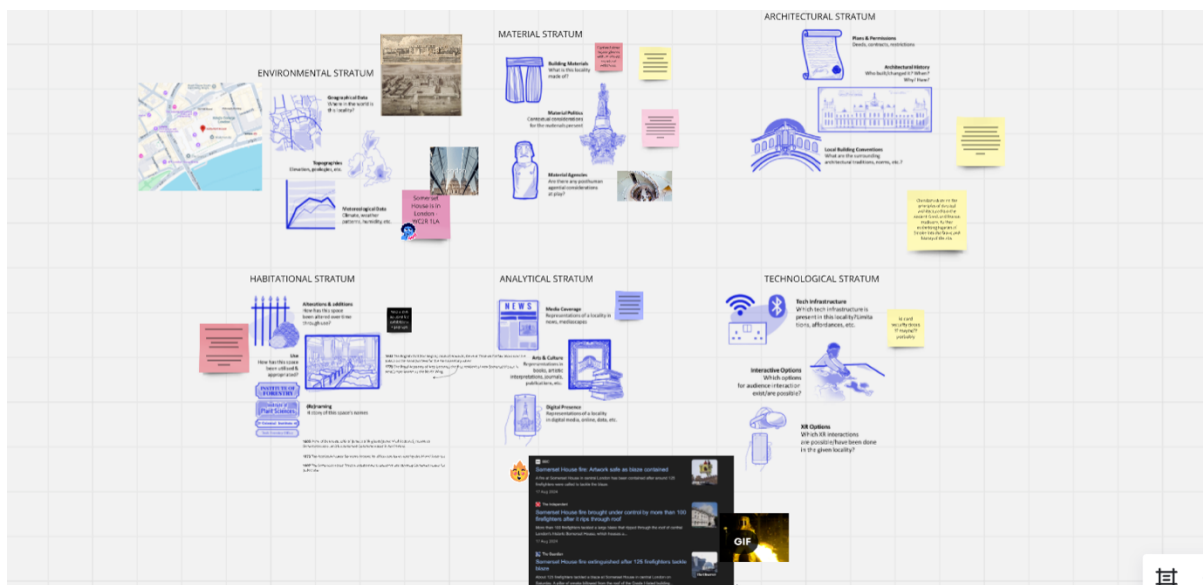


Figure 18: Focus Group 2.2 – Miro board used by university students.

From the university student focus groups, the main points of feedback were that the taxonomy supported communication in their research groups, allowed individuals to take responsibility for specific types of information, and encouraged them to dive deeper into details (see Figures 17 and 18).

Based on this iterative prototyping process, the conceptual taxonomy is thus comprised of nine strata. However, I fully acknowledge that its current iteration might not be exhaustive, especially if applied to other disciplinary contexts than the given examples. The nine strata are:

- environmental** – information about geological and geographical pre-sets (e.g. climate conditions, geographical context, geology, boundaries, etc.)
- material** – information about the materials which constitute a physical space (incl. political, cultural or spiritual significance)
- architectural** – information about a site's building history and the people involved in shaping it
- habitational** – information about a site's use, adaptation, and development based on everyday use

- e) **analytical** – traceable sources, interpretations, and abstractions of a space in media and discourse
- f) **content creation** – motivations and processes behind the design, editing, and implementation of an XR interaction
- g) **technological** – limitations and affordances of technological possibilities in a space or project
- h) **user** – information about how users interact with an XR application (e.g. user studies, market data, usage metadata, documentation, etc.)
- i) **positional** – reflection on the researcher’s motivations, restrictions, and expertise

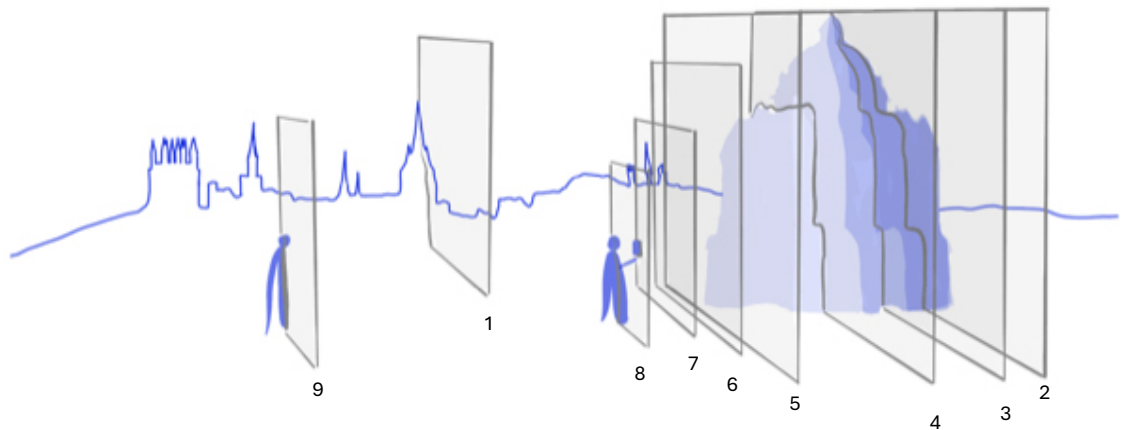


Figure 19. Overview of the proposed strata. Left to right: positional stratum (9), environmental stratum (1), user stratum (8), content creation stratum (7), technological stratum (6), analytical stratum (5), habitational stratum (4), architectural stratum (3), material stratum (2).

Target Users

This taxonomy is designed with dual functionality in mind: in the short term, its target users are XR researchers and practitioners. With a more long-term perspective, it should be adaptable to lay use in user-generated content creation. Thus, it initially leans on expert engagement to establish information paradigms which, eventually, enable lay users ‘to visualise a particular system component within a broader landscape’ and ‘reflect on its role’ (Maddali & Lazar, 2023). A shortcoming of this approach, however, is that it affirms academic or professional monopolies on trustworthy information, positioning less formalised ways of knowing (Merriam & Grace, 2011) as a secondary step. However, in doing so, it circumnavigates editorial questions which arise in user-generation content creation in relation to reliability and transparency. Rampant misinformation has become such a dominant problem online (Epstein et al., 2020; Gamage et al., 2022; Zhou et al., 2023) that the need for some degree of academic rigor and research ethics in a future spatial information database cannot be easily dismissed. By aiming this taxonomy towards academic and professional use first, this paper seeks to encourage setting a precedent for rigorous research practices.

Taxonomy

The sequence of the proposed strata as presented in this paper moves from the material to the immaterial, overlaying a physical chronology of space with a discursive one. However, the strata intersect and interact with one another and are not intended as sequential or linearly chronological.

To accommodate for both factual and interpretative data, each stratum is split into a descriptive and an interpretative section. To ensure transparency (Beacham et al., 2006), these should be kept as distinct as possible. For example, if there is a historical document which proves Architect A consulted Architect B's drawings, this should be categorised as *architectural stratum > descriptive*. In contrast, if the influence of Architect B's work on Architect A is an assumption based on style similarities, this information should be categorised as *architectural stratum > interpretative*. This taxonomy is designed to be adaptable to various disciplinary foci and is intended for use throughout processes of research, design, content creation, prototyping, programming, user testing, and project evaluation for logging, reflection, and data sharing. To demonstrate how this taxonomy can be applied to a locality, each section contains a sample from a case study of the Indian Institute, which formed the basis of the subsequent prototype study.

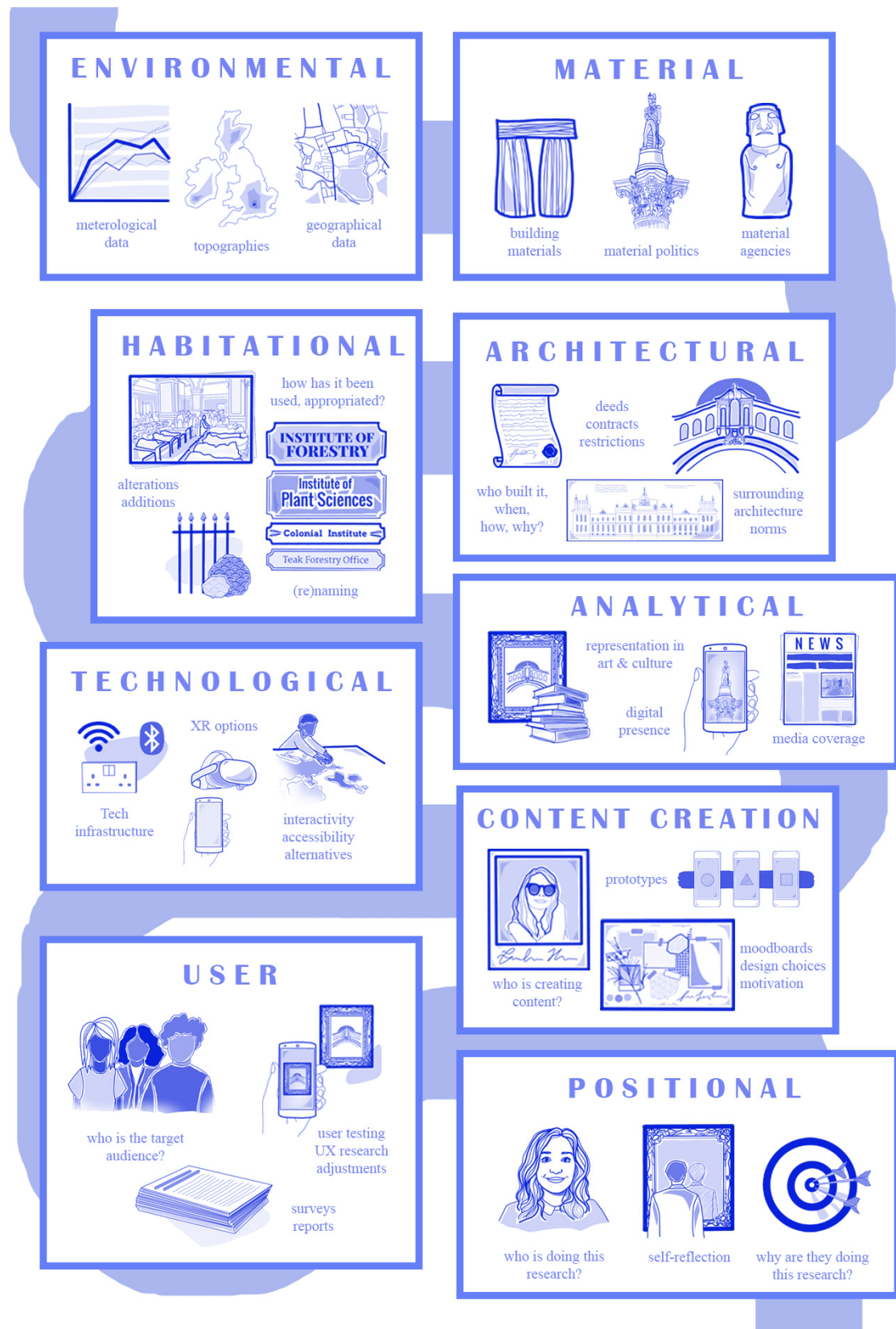
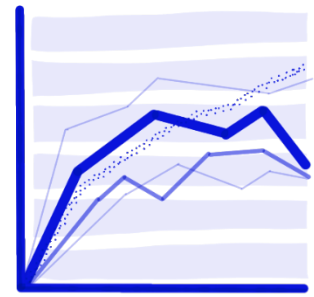
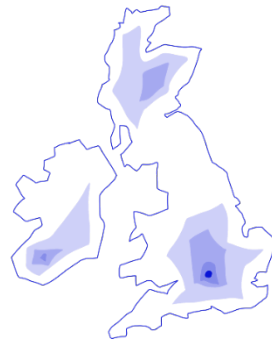


Figure 20. Simplified overview of proposed workflow.

Environmental Stratum



Descriptive

The *environmental stratum* describes geological and geographical pre-sets. This includes climate conditions, geographical context, geology, boundaries, and material conditions of a site. It draws on the *Natural Factors* outlined in Kaklauskas *et al.* (Kaklauskas et al., 2010), as well as Rupert Jordi's (Jordi, 2016) considerations on previous iterations of a given space and its situated context. Practically speaking, this stratum collects empirical data such as weather reports, archaeological findings, and geological data which may influence interactions with a given site. For example, creating an AR experience for the Oxford Rhodes statue, an outdoor site in a relatively cold climate with significant chances of rain, will require a different assessment of environmental limitations than a VR experience in an indoor museum in urban Cairo.

Sample (Indian Institute):

Category	Data	Source(s)	Notes
Geo- Coordinates	51.75492858886719 Lat. 1.2541322708129883 Long.	-- (GPS Coordinates, 2024)	N51°45'17.743" W1°15'14.876"
Continent	Europe		
Nation-state	United Kingdom (since 1801, Great Britain since 1701)		
Region	England (since 927), Oxfordshire		
Type of settlement	City (status granted 1542)		
Locality	City of Oxford		
Altitude	Oxford City Centre is 70 m (230 ft) above sea level.		
Climate	Maritime Temperate Climate		Cfb categorisation in Köppen-Geiger

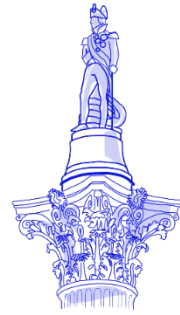
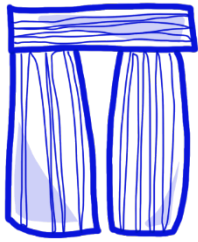
Interpretative

The interpretative section of this dimension includes presumable influences environmental conditions exert on other spatial strata (e.g. material corrosion based on humidity) and interpretations of how the descriptive data might impact the given project.

Sample (Indian Institute):

Oxford is dry enough to allow the feasibility of a variety of technological interventions and temperatures are manageable enough throughout the year that experiencers can stand in exposed spaces for prolonged periods of time. Air pollution should not present a technological obstacle, but light pollution might during the night, depending on the interaction. Sun orientation may pose a challenge to light conditions during some periods of the day.

Material Stratum



Descriptive

The material stratum describes the material nature of a given site. It sits at the intersection of environmental and architectural factors and may include the availability or political significance of certain building materials (Nejad et al., 2020).

Sample (Indian Institute):

The Indian Institute was built of Milton stone, a local stone to Oxfordshire.

Interpretative

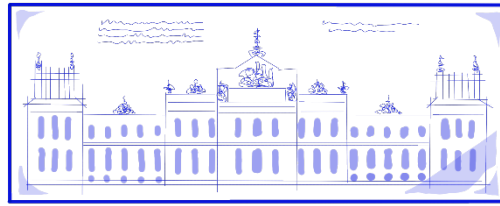
In some localities, this stratum may include considerations of material agencies. Whilst not an established concept within Western academia, the potential of this perspective to reflect displacement, spiritual agencies, or innate material conditions (Rosiek et al., 2020; Watts, 2013) is particularly relevant in the context of sites of contestation, displacement, and oppression.

An example where this would apply, for instance, is Hoa Hakananai'a (*see middle illustration above*), an artwork currently held by the British Museum, which is considered an entity by the community it was taken from (Pitts et al., 2014). Contextualising Hoa Hakananai'a should entail considerations of *agential realism* (Barad, 2003), a school of thought which invites researchers to move beyond preconceived notions of consciousness and intelligence. Bruno Latour suggests that non-human agents need to be recognized, appreciated, and given voice (Latour, 2014), but what that entails at a practical level is less clear. Within this taxonomy, material agencies present a question to be raised, a starting point for deeper engagement with the histories and discursive connotations of a site.

Sample (Indian Institute):

'Towards the end of the Gothic Revival, architects returned to using local materials and Taynton and Milton stone were again used more widely during the last quarter of the 19th century' (Gomez-Heras et al., 2010, p. 105).

Architectural Stratum



Descriptive

The architectural stratum stems from architectural site analysis, which is one of the practical methods derived from space syntax theory (Sailer & Koutsolampros, 2021). It collects sources which describe the interplay of architects, commissioners, politicians, legal and societal ramifications which have shaped construction (see Weizman, 2017). The descriptive section includes histories of site construction, biographies of the individuals involved in the construction process, and standard factors of an architectural site analysis (*Archisoup*, 2019). This contains:

- entrance locations and types
- existing buildings
- distances to neighbouring buildings
- heights
- alterations over time
- previous planning permissions and applications
- access to public and private routes
- vehicle and pedestrian access
- levels
- gradients
- exposure
- sun paths
- shading
- prevailing wind direction and shelter
- root protection areas
- vegetation removal or maintenance areas
- ownerships
- ecologically protected species and zones
- impacts
- obstructions to visibility, light or views,
- hazards
- electricity lines
- drainage
- telephone lines
- sub-stations
- derelict buildings
- unfinished building works

Not all of these factors will be relevant to every site but should be initially considered. Depending on the history of a site, this section could be split into various iterations of a space and illustrate different phases of (re)construction (see Wilczek, 2021).

Sample (Indian Institute):

Category	Data	Source(s)	Notes
Construction years	1881-196		
Entrance locations/ types	Main entrance to building from Broad Street		
Existing buildings	Seven building were torn down to make space for the Indian Institute, which was built in three phases		

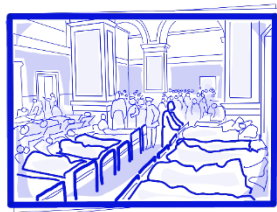
Interpretative

The interpretative section of this stratum focuses on inferred or speculative aspects of a space's construction history. It could also interpret architectural choices, such as intended hierarchies based on spatial positioning.

Sample (Indian Institute):

The end of the Indian Institute as an institution was controversial as the money raised for its construction came out of private funds intended for this purpose. The Institute was to be, in Monier-William's words, 'an everlasting symbol of amity' between Oxford and India (Evison, 2004, p. 1).

Habitational Stratum



Descriptive

The habitational stratum describes the use, adaptation, and development of a space based on everyday use (see Vischer, 2008). The descriptive section encompasses the histories of this use, as well as use-related aspects of architectural site analysis (Zimmerman et al., 2007a). This contains:

- site security
- distances to neighbouring buildings
- Listings (Grade II, II*, I in the UK)
- noise levels
- conservation areas
- rights of way
- SSSI (Site of Special Scientific Interest) status
- gradients
- exposure
- private views out, public views in
- wind exposure
- neighbours
- pollution
- flooding/landslide areas
- obstructions

If used in the planning stages of an XR project, these factors should be considered in relation to potential affordances and challenges they might pose to designers or developers.

Sample (Indian Institute):

Category	Data	Source(s)	Notes
Site security	Inside: 24h porter for the Oxford Martin School, CCTV on the street, security cameras and alarms	Pers. obs.	
Noise levels	Some street noise during the day, fairly quiet at night	Pers. obs.	Good opportunity to include sound files

Interpretative

The interpretative section of the habitation stratum can infer how conditions of use interact with other strata (see Iwarsson & Ståhl, 2003). This could entail restrictions of access, walking paths, signage, impact of tourism, stats on visitor density in different seasons/time of day, etc. and their effect on potential projects.

Sample (Indian Institute):

Any XR interaction using shape recognition software should consider distances to the building carefully. There is a fairly busy roundabout right by the building, and during busy seasons, there are a lot of tourist groups who gather in the area. Therefore, creating vantage points from which experiencers can interact without obstructions is crucial.

Analytical Stratum



Descriptive

The analytical stratum describes the interpretations and abstractions of a space in media and discourse. This includes source materials, reflective interpretations, and creative abstractions of a space through scholars, journalists, writers, and artists (see Ramone, 2019). This may include newspaper mentions, book locations, folklore, academic articles, film settings, documentaries, music videos, songs, poems, tweets, posts, etc.

Sample (Indian Institute):

The Indian Institute has been mentioned in local newspapers all the way back to its initial building process (see Figure 21).



Figure 21: Mentions of the Indian Institute in the Oxford Bulletin, 1896.

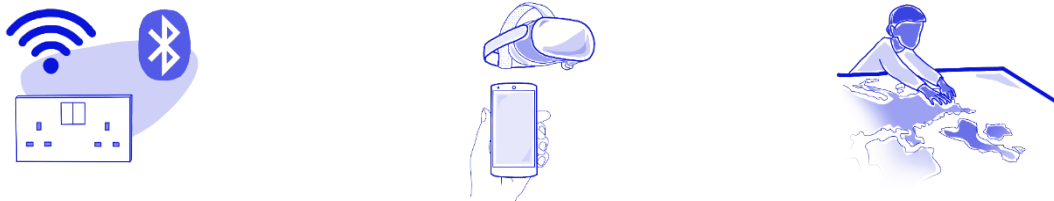
Interpretative

Descriptive and interpretative elements might be more conflated than in other sections, which requires transparency in relation to the selection process of information.

Sample (Indian Institute):

In an article of Oxford Today in 2003, one descendant of donors to the Indian Institute stated: 'If anything, the building is a symbol of the disgraceful betrayal of trust the University displayed towards its friends and supporters in India' (Evison, 2004, p. 105).

Technological Stratum



Descriptive

The technological stratum describes appropriations of a space through technologies. In the descriptive section, this entails cataloguing existing pre-sets for digital technologies (network access, Wi-Fi coverage, etc.) as well as any 'virtual architecture' (Maher et al., 2000) created by previous projects. It should cover factors which could influence the affordances and limitations of a space in relation to technological intervention.

Sample (Indian Institute):

Category	Data	Source(s)	Notes
Mobile network coverage	Good	Pers. obs.	Depending on one's network, coverage is as good as on most UK city streets
Wi-Fi availability	Researchers: EduRoam, public: OWL. Speed range 50-300Mb/s.	Pers. obs.	

Interpretative

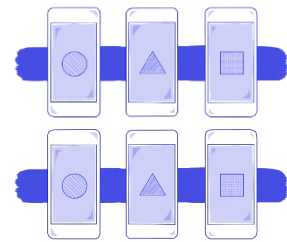
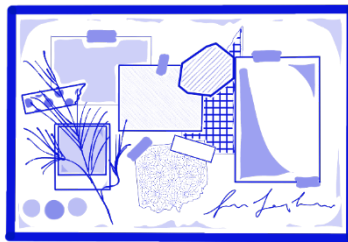
The interpretative section should use the descriptive section's data to infer the feasibility of specific types of technological interventions. This is particularly relevant for researchers and practitioners who might access this information in the future. If a team in 2015 decided against an AR experience to contextualise the Rhodes statue because public Wi-Fi coverage was too poor, or because the quality of AR images did not work with the lighting conditions, this would change how a team in 2025 would interpret their choices.

This section is also suitable to log technological details of development processes and address technological biases, app development stages, information architecture, interface choices, and path plotting.

Sample (Indian Institute):

Since this AR app was aimed at heritage students who may engage in larger groups, we created different interactions which were spread in a line on the opposite side of the street, to encourage students to stand in a line and not step too close to the street.

Content Creation Stratum



Descriptive

The content creation stratum catalogues creative and interpretative choices throughout a project. This includes processes of creation, prototyping, collaboration, and documentation. Additionally, it may include the respective positionalities and rationales of content creators.

Sample (Indian Institute):

The visuals were created by a designer with a background in performance design, using Adobe Photoshop and Figma. There were three iterations of this prototype, each exploring different aspects of the interface.

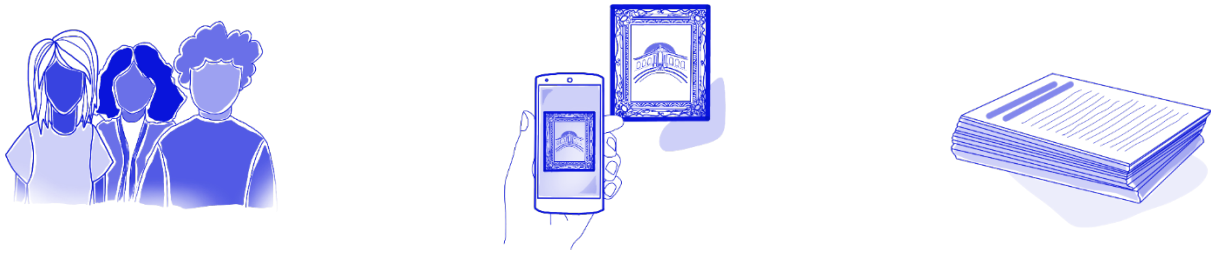
Interpretative

The interpretative section should include any materials which contain inferred information rather than documented facts. In the context of political issues, an additional consideration regarding the agencies of communities which are represented in the content may apply, especially if said communities are not actively part of the content creation process (see Costanza-Chock, 2020).

Sample (Indian Institute):

In considering who might be interested in contributing to spatial information about the Indian Institute, the longstanding bilateral history of who the Indian Institute was intended for is relevant, and the potential for remote engagement.

User Stratum



Descriptive

The user stratum describes the use, interpretation, and appropriation of an XR experience in a given space (see Wiredu, 2007). Broadly, it covers the data and metadata which would constitute data collection and discussion in research project. In the descriptive section, this may include user studies, market data, usage metadata, and any other available documentation.

Sample (Indian Institute):

The intended users are heritage students and researchers for the first iteration of this app.

Interpretative

The interpretative section reflects expectations, actualisation, and reflections of user interactions before, during, and after a project. For experiences in which users co-produce content, a section reflecting on user/creator identities might be useful (Nebeling & Speicher, 2018).

Sample (Indian Institute):

Based on initial responses, there should be an option to manually input content and upload images.

Positional Stratum



Descriptive

The positional stratum encompasses self-reflection of the researcher or practitioner conducting a project. It should acknowledge their motivations, political agendas, source choices, and biases as thoroughly as possible. The descriptive section may include researcher profiles, field journals, project rationales, documentation, pitch decks and funding agendas.

Sample (Indian Institute):

This project was conducted as part of a study focusing on sites of spatial enactments of Coloniality in Oxford.

Interpretative

The interpretative section should offer a meta-reflection on both the project and the process of conducting the entailed analyses.

Sample (Indian Institute):

The editing of user-created content was done by one researcher based at the University of Oxford.

Adaptation

This conceptual taxonomy has been designed for format adaptability. Across XR research and practice, levels of technological literacy, work approaches and budget restrictions vary drastically. An advantage of this structured approach is that a community project with senior participants in rural Ireland could log their analogue data in the same system as an immersive art piece in the Emirates which uses AI-generated metadata tags. To refine the strata outlined in this taxonomy, a variety of use cases and applications would be valuable. Trial and error across a wide spectrum of projects would highlight present areas of improvement and possible expansions³.

Analogue

In a low-tech project or work which involves participants less comfortable with digital tools, this taxonomy could be used in text form. As a faceted folder system, it could be adapted onto whiteboards, post its, and other tangible media which facilitate collaborative processes. These formats could later be scanned and digitised in order to be included in an online database.

Database

In an online database, information can be logged, uploaded, arranged, shared, annotated, and revisited similar established web tools. On a desktop screen interface, the different strata of this taxonomy could be layered on top of an image or video of the site. Users could toggle between different strata, viewing them individually or overlay information from different strata to create vertical cross-connections. This would closely follow the principles laid out in Weiland & Dachsel's *Faceted Folders System* (2008). Sources, metadata, and annotation could be hyperlinked, taking user to the relevant documents or log entries. While this version would flatten spatial data to two-dimensional screens, it would also allow access through a wide array of devices and not require any specialised software or downloads. However, given that more and more people access the Web through mobile devices, a more phone-friendly approach might be equally valuable.

App

Considering a hyperlinked database as a mobile app raises questions of scale. This is where it becomes crucial to not think of a mobile screen as a smaller version of a desktop, but to consider them as part of spatial exploration. With a mobile app, users can walk around a physical space and interact with data in-situ or recreate spatial configurations of a site remotely. In addition to hyperlinking sources, a mobile app can facilitate the spatial placement of these sources. This may support accessibility, invite playful engagement with critical knowledge

³ I am conducting a testing phase as part of my thesis.

reproduction, and foster experimental approaches to organising spatial data.

XR

While a mobile application of this kind is already a form of AR, future XR innovation is likely to become even more immersive. Using smart glasses or MR contact lenses (Gmeinwieser & Schock, 2020; Smith, 2019; Wiemer, 2021), for instance, would open new possibilities for users to engage with spatial data. Faceted folder systems might give way to more space-oriented indicators, such as colour-coded auras for objects, sites, or sources, for instance, and annotation might include a variety of formats.

Spatial Wiki

To create a full wiki version of this taxonomy, vertical spectra of qualification should be considered too. Rather than a faceted approach which uses parameters such as themes, time periods, or locations, these qualifications could express how contributors position their content (e.g. on a scale from *historical source material* to *artistic abstraction*). However, to explore what these parameters might be, and how different research disciplines might operationalise them, this taxonomy would first need to be tested and refined by a number of prototype studies.

AI

Another relevant consideration is how AI-generated spatial annotation can interact with a user-generated content model. Since contemporary LLMs⁴ draw on established information resources, effectively reproducing their biases (Geburu, 2020; Noble, 2020), the use of AI might, at first glance, seem antithetical of this taxonomy. However, there is a wealth of research (Gobbo et al., 2022), which is actively tackling these issues and by the time a spatial wiki application of this taxonomy might emerge, AI could very well be a key player to support it.

⁴ Large language models (LLMs) learn statistical relationships from text documents during training and are one of the currently most common forms of AI.

Prototype Study

Indian Institute

Turning this taxonomy into an XR prototype encompassed four stages: a paper-based version, an online folder system, a digital Miro board, and wireframes for translating the embedded information into an AR application. As outlined in the paper, different formats of this taxonomy lend themselves to certain uses, and by utilising a variety in this prototype study, I aim to highlight these productive differences.

Analogue

The first version followed a low-tech/no-tech approach, which could be applied without any digital technologies involved. Even though I used a digital word processing programme (Microsoft Word) for time efficiency and incorporatability in my wider work, this version of the taxonomy could also be used with pen and paper, analogue photographs and source materials. It maps out similarly to structured research notes, detailing features of a space and its past configurations. One of the main points of feedback from earlier user studies was that people felt the breakdown of strata, as well as the specific prompts within each stratum, helped them think about their work differently and pay attention to different details. While the analogue format provides this framing, it does produce a long document of facts which are not easily put into dialogue with one another. Therefore, I created a digital version which allowed me to sort this information into different folders, and have subfolders for different media formats.

Digital (Notion)

The first digital version offers more options of spatial arrangement, with each folder containing subfolders and hyperlinked information (Figure 22). Notion is a platform which allows for the incorporation of several other tools, and is built for team collaboration. Therefore, it is easy to share information, make changes, and link sources in this format. However, the folder system means that information needs to be discretely detailed in a specific category, or repeated, so that other collaborators or future researchers can efficiently use it. Using Notion was a next step to the focus group trial described in the paper, in which a group of researchers collaborated on a Google Doc. The ability to create folders and subfolders mitigated their feedback regarding long digital documents which required a lot of scrolling, as well as being a more mobile- and tablet-friendly solution.

Digital (Miro)

Using a collaborative Miro board to co-create a spatial analysis worked very well my student-based focus group and offered a more panoramic impression of the different dimensions of the analysis. Being able to float between categories encouraged participants to move information across categories, place data in between strata, and annotate each other's contributions. In the process of using Miro in this prototype study, I found its functions practical for differentiating between formal information, sources, and notes (e.g. the interpretative portions on post its which annotate the factual information), but for the purposes of informing an academic paper, for instance, this may not be the easiest approach to export into a textual format. To streamline a translation into XR wireframing, however, Miro formed a moodboard-like basis which lent itself to visual information arrangements (see Figure 23).

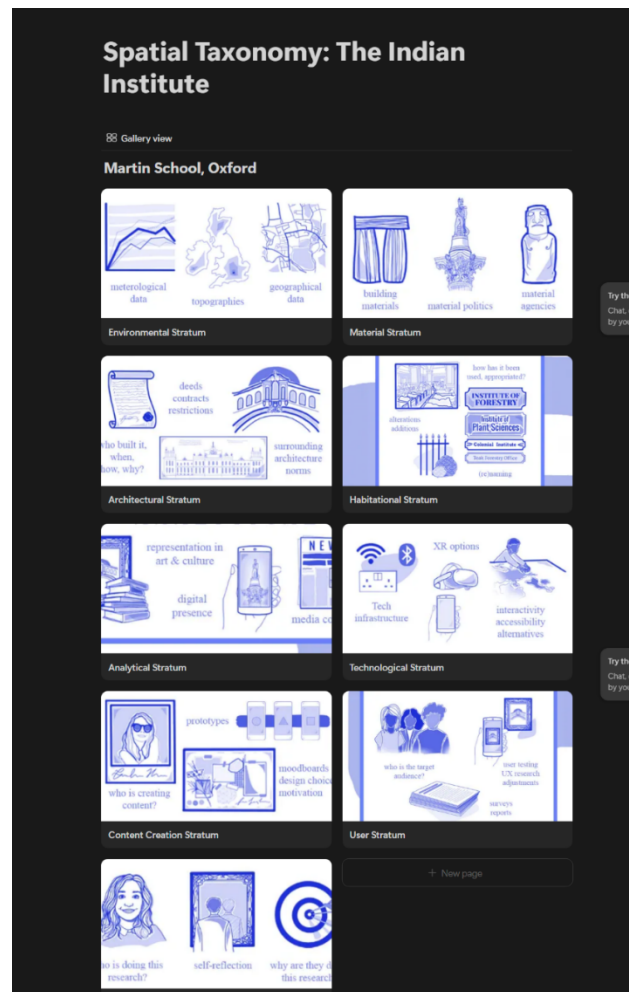


Figure 22: Notion version of the Indian Institute analysis.

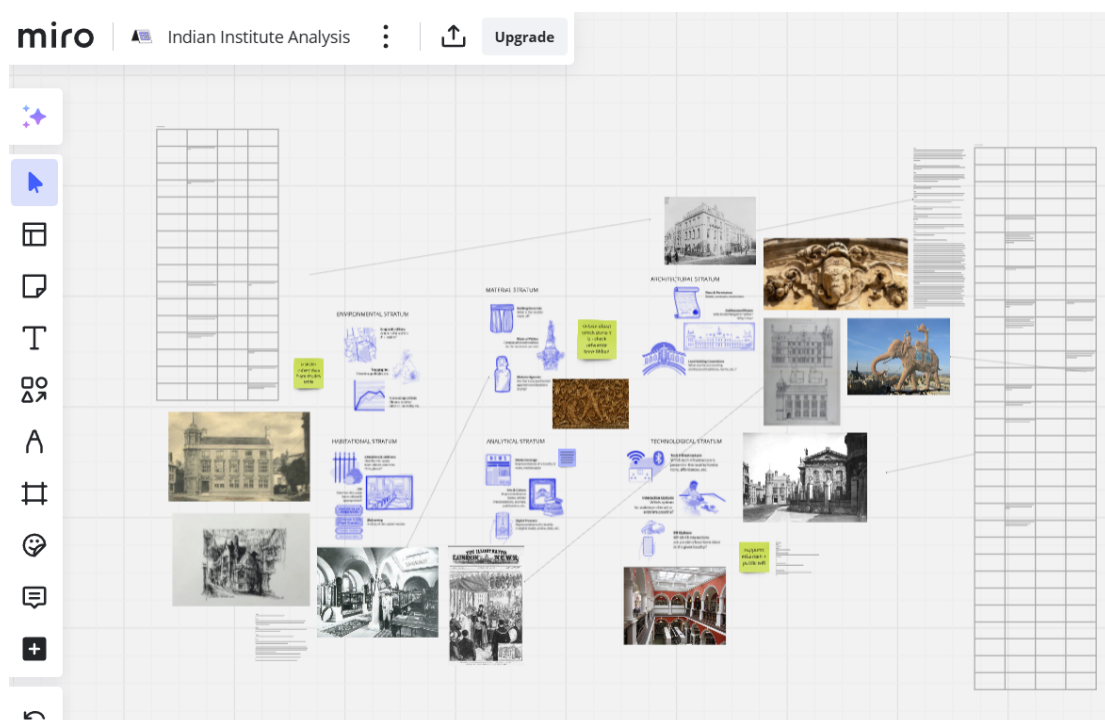


Figure 23: Miro version of the Indian Institute analysis.

AR Prototype

The AR prototype was designed with the intention of building out this taxonomy to enable user-based content contributions as well as providing in-situ engagement with the space. The interface design followed the principles of Weiland & Dachsel's system, but in AR, this posed two key challenges.

Firstly, the incorporation of textual and image information on a much smaller screen. Tools like Notion or Miro allow for a panoramic visual engagement with vast amounts of audio-visual data, including zooming in and out of clusters of information, and flexibly rearranging data as it is gathered. For an AR application which has a layer of digital information laid over the camera-framed material environment, these functions are less practical. I adapted the zooming function by selecting specific architectural features which could be zoomed into, and only making the annotations available in the zoomed-in image, thereby creating a clear interactive path (see Figure 24). If an experiencer wanted to add information to an architectural feature which was not already included in this function, they could long-tap that feature in order to add a note, requesting it to be added. While features like this are helpful for potential future expansions, incorporating too many of them would have made the interface too cluttered and confusing for first-time experiencers. Therefore, I opted for a fairly simple folder design for most functions, organised according to the taxonomy's strata (depicted as colour-coded circles in the prototype, see Figure 25).

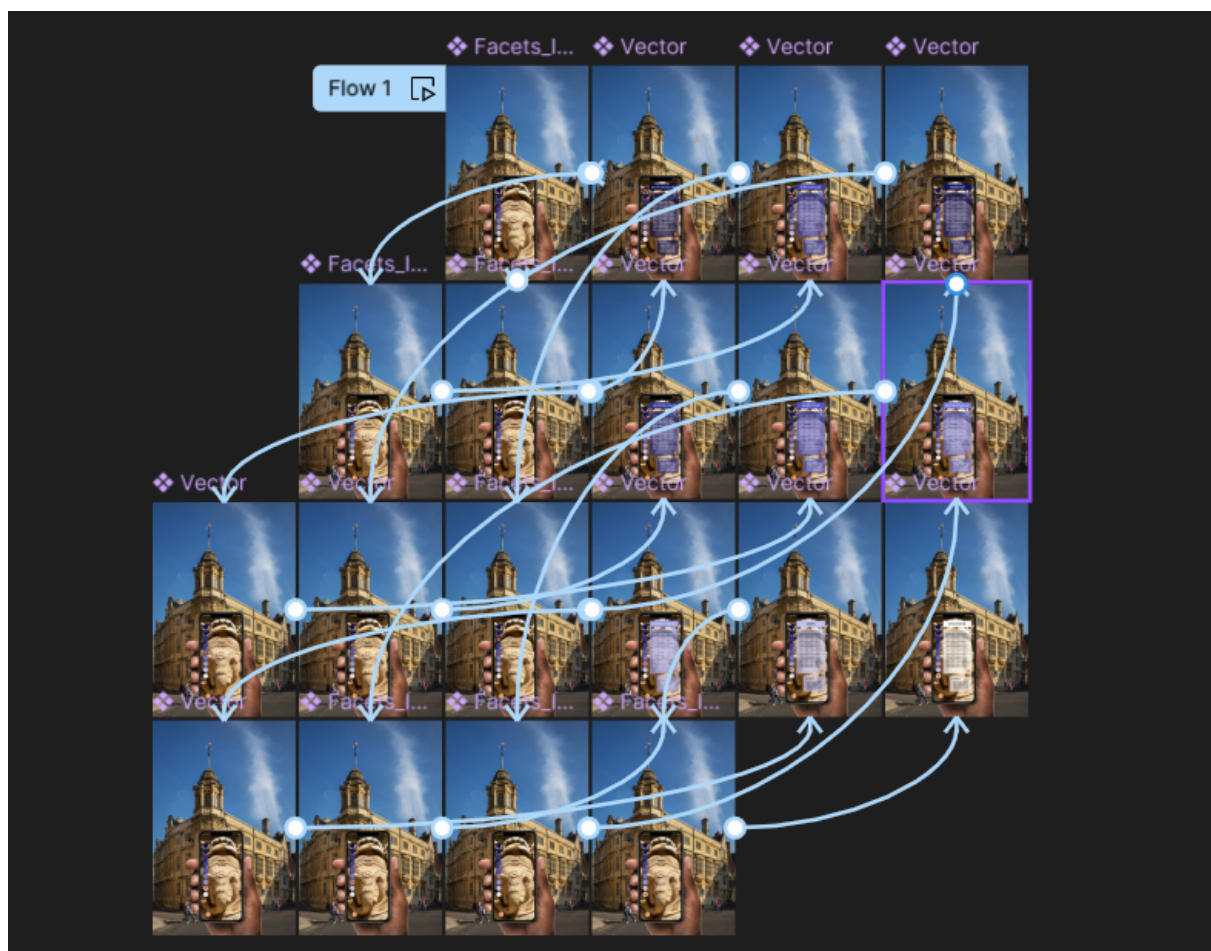


Figure 24: Path connections in Indian Institute prototype.

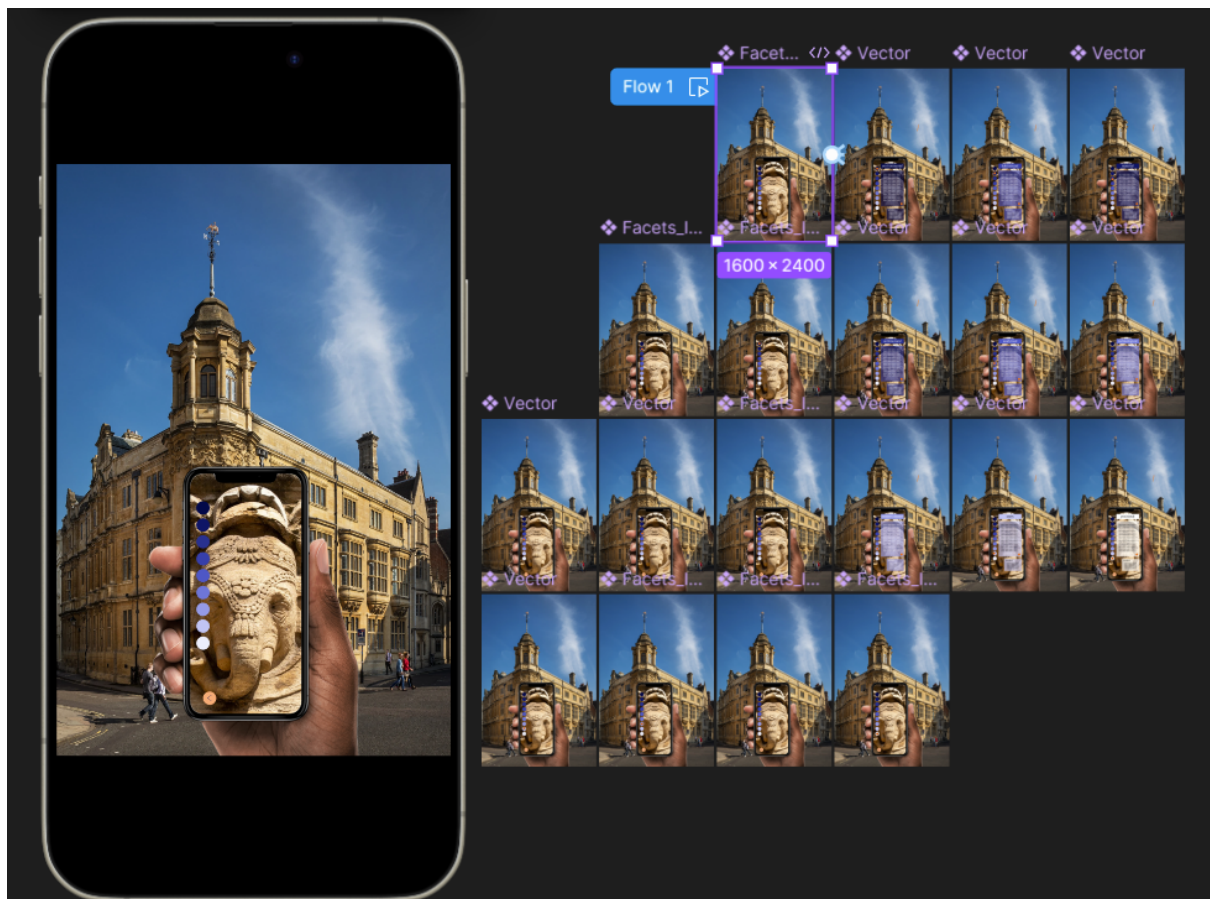


Figure 25: XR prototype for Indian Institute.

The second challenge emerged from this AR application being designed for outdoor use, which meant it had to be able to work with differing light and weather conditions, factors which may distract marker recognition (e.g. double decker buses interfering with scanning) and potential connectivity issues. While these factors were not my main focus of assessment for this prototype, they do pose a key design difference in comparison to more contained, remote options like Miro. The counterpoint to these challenges, however, is the affordance of AR to let experiencers engage on-site, which invites a different type of spatial exploration and interaction from remote tools.

Reflection

Hyperlinking

The versions of this taxonomy which allow for hyperlinked information are not only more efficient in creating a network of context, they also make collaboration and in-team communication easier. Based on the experience on this prototype study, as well as previous focus groups, I would recommend choosing a hyperlinked version whenever possible. This also aids documentation processes. For instance, when mentioning a Grade II* listing in the UK, linking in information on the implications of this protection grade is useful for any researcher or practitioner unfamiliar with this grading system, but can also be updated as rules for upkeep, etc. change over time.

Conceptual Limitations

An inherent challenge of the current layout of the tool is that distinguishing between descriptive and interpretative sections is sometimes difficult, as is allocating which information belongs into which category. In the format of a linear document, I did not want to be too repetitive, but if this stratification model was applied in a more networked or even spatial set up, these overlaps could be points of interest rather than inconsistencies. This is predominantly a limitation of this medium. In a networked medium like a hyperlinked wiki or other form of web presence, one could allow for toggling between different densities and thematic arrangements of data and metadata. In a spatial medium like VR, one could arrange this information proportionate to the spatial data it contains, and annotate metadata straight onto different documents and datasets. This would likely improve the potential of collaborative communication with other researchers and practitioners, allow for a more seamless integration of audial data and a better interspersed of data and metadata.

Interactive collaboration

A key objective of creating this conceptual taxonomy was to create a communication tool for research and design teams to organise and share spatial data. In applying Facets of Space, this affordance stood out as an add-value of the taxonomy – it was useful for me, as a researcher analysing different sites around Oxford, to have a structured way of organising the data I collected, but it was invaluable in sharing this data with other researchers and designers. Throughout this prototype study, I had numerous exchanges with the experts who I interviewed and conducted the focus group with, and there was a notable difference in how we could communicate about this work and its priorities. A crucial factor in this affordance are different layers of depth – this taxonomy can be used to provide a one-page (or one-moodboard) overview of a spatial analysis, but it can also convey a hyperlinked collection of months of research. I view this flexibility as essential to how useful this tool can be in practice – that it can be as analogue or interactive, as bullet-pointy or in-depth as one needs it to be for a specific project or purpose. One of my colleagues described the experience of working with this tool as being able to enter someone's 'mind palace' and being able to decide how many doors one opens. I appreciated this metaphor to describe this flexibility and underline this taxonomy's versatility.

Conclusion

The taxonomy outlined in this chapter is designed to make interdisciplinary and cross-industry exchange of spatial (meta)data more structured, transferable, and transparent. In the advent of immersive technologies, this is becoming a necessity if spatial information is to serve communities and local individuals. Lay users, designers, artists, creators, and companies are already using these technologies, advancing them, changing them, and all the rigor of individual projects is going to be of little accumulative value if we do not find ways to effectively exchange data and expertise. The strata presented in this paper are intended as a starting point for these conversations. Concerned with both short-term applicability and long-term implications, it makes two key contributions.

Firstly, this taxonomy provides an adaptable categorisation system which supports accumulative knowledge exchange within the HCI community. It is designed to prevent data redundancies, increase transparency, and foster communication between projects. Initially aimed at XR researchers and professionals, this taxonomy was created with potential future upscaling in mind. If adapted into public use, its dynamics of data editing and sharing would

need to be considered carefully.

Secondly, this taxonomy contributes to the emerging literature on XR interactions which conceptualise immersive technologies as a frontier of experimentation, exploration, and experience. Spatial computing introduces new possibilities to how data and metadata may be embedded in our shared environments, and these experiences ‘could augment reflective and shared memory practices’ (Maddali & Lazar, 2023) as much as the spaces themselves.

At the crossroads of another technological turn, spatial (meta)data organisation presents an opportunity to reshuffle the cards. It provides a chance to ask questions about the systems which have made themselves ubiquitous over the past two decades and look towards our community of researchers to come up with innovative, experimental alternatives. This taxonomy is a step towards learning from each other and fostering interdisciplinary exchange to produce more diverse and inclusive XR interactions.

Chapter 6: Rhodes Not Taken

CHAPTER 4

The Blue Tooth Spectrum

RQ: What are the gaps in existing XR taxonomies and how can we improve them to better position localities in space?

Conceptual taxonomy

CHAPTER 5

Facets of Space

RQ: How can spatial (meta)data for XR be organised in a structured, transferable, and transparent way?

Conceptual taxonomy, Prototype Study

CHAPTER 6

Rhodes Not Taken

RQ: How can spatial histories be re-narrated to make transparent the effects of Coloniality?

Virtual History Analysis, Prototype Study

CHAPTER 7

Breaking the (Virtual) Chains

RQ: How can XR-facilitated activism support material change?

Critical Analysis, Prototype Study

The previous two chapters established how a locality can be positioned in hybrid space, and how a site can be analysed in a structured, transparent, and transferable way. Even though the prototype study of *Facets of Space* shows a translation into XR, this form of XR content production is not particularly experimental. It uses participatory principles from digital mapping and wikis, which is important for the future of annotation in hybrid spaces, but it is not necessarily an innovative way of engaging people through XR. As mentioned in the introduction, one of the pitfalls of immersive technologies is that they are, despite their interactive potential, often relegated to the norms of other media. This chapter therefore proposes an experimental way of engaging with spatial histories. The first part, the third integrated paper, does so through virtual histories, a method which speculates on ‘what if...?’ scenarios in historiography. It employs an original approach to virtual histories which is specifically intended for spatial enactments of histories. The paper uses the statue of Cecil J. Rhodes at Oriel College, Oxford, as its central case study. The second part builds on this paper’s findings, using the same site for a prototype study which conjectures on how XR may facilitate engagement with who (or what) could replace Rhodes in his hypothetical absence. While this chapter is aimed at critical historians, it is my personal belief that every academic discipline can learn from historiographical approaches. The second part speaks to historians as well as XR researchers and designers, and intends to encourage experimental approaches to contextualising spatial histories through immersive technologies.

RQ3: How can spatial histories be re-narrated to make transparent the effects of Coloniality?

Methods:

- Virtual History Analysis
- Case Study
- Research-through-design
- Prototype Study

Contributions:

- Virtual history analysis which demonstrates its potential for fostering critical engagement with decolonial spatial histories
- Application of virtual history analysis to an AR prototype which demonstrates its potential for XR interactions
- In-depth insights into the political, financial, and spatial implications of the case study site of the Rhodes statue at Oriel College, Oxford

Target audience:

- Public historians
- Heritage researchers & practitioners
- XR researchers & developers
- Activists



Rhodes Not Taken

A Virtual History of Colonialism, Capitalism, and Intergenerational Responsibility

Abstract

This paper employs a virtual history approach to unravel a complex web of societal threads tied to controversial monuments, using the statue of Cecil J. Rhodes at Oriel College, Oxford, as a case study. It examines historical and political contexts to identify key moments of cultural shifts and the potential for alternative paths. Each scenario is assessed in terms of its political, monetary, and spatial implications. Furthermore, this paper investigates the potential effects on decolonial movements, political climates, and funding strategies. The findings shed light on the complex interplay between historical circumstances, political decisions, and societal changes, highlighting the importance of considering timing and context when examining the removal of controversial statues. This research contributes to a deeper understanding of the multifaceted considerations involved in contentious monument removals and their long-term effects on institutions and societies. Its practice-oriented output is a workflow for spatial virtual history creation.

Introduction

In the last years, more statues have been removed in Britain than in decades before (Mohdin & Storer, 2021). Notably, in the 2020 Black Lives Matter (BLM) protests, local activists and communities came together to topple the statue of slave trader Edward Colston in Bristol. They subsequently placed evocative artworks on and around the empty plinth to protest the permeation of a White supremacist figure in this public space (Cole, 2023; Nasar, 2020). This contributed significantly to widespread media debates about *who* should be commemorated in our public spaces, and *how*, as well as broader questions about commemoration practices. Are public statues meant to educate or to celebrate? Is removing a statue erasing history or a move to detach from ideologies we collectively no longer agree with (Drayton, 2019)? Why should anyone care?

The presence of these questions in public discourse illustrates that statues embody political choices. Most Modern statues were built with wealth which derived from the exploitation of foreign territories, the labour of marginalised peoples, and celebrates the thriving of a global system which subjugates the majority of the world's population. In the West, the person commemorated is likely a benefactor of these systems, if not an active perpetrator of colonial violence. Statues perform 'the economic, social and political ideologies of the society that creates' them (Jacob, 2012), and keeping, maintaining, and protecting them is an active affirmation of these ideologies.

As our collective ideological positions change, some architectural presences thus become intolerable in public spaces. This is made evident by an example Chantiluke *et al.* (2018) suggest: if there was a Hitler statue at the helm of an Oxford building, it would have been taken down decades ago, irrespective of how much money he

might have donated. No one would argue that taking down such a statue was erasing history, or that a plaque which explained the statue's presence would suffice. Accordingly, the issue is not the premise of removing a statue – which is a historically well-established cultural practice (Drayton, 2019; Gill & Hunter, 2021; Lipkin, 2000) – but the question of whether the actions of the person commemorated are unacceptable enough from a present perspective to solicit their removal from a public space.

This is why statues and memorials to perpetrators of colonial violence are particularly controversial: coloniality is a 'pervasive presence' (Nabulsi, 2017) which has been 'distilled into the veins of Europe' (Césaire & Pinkham, 2000) to the degree of obscurity. Highlighting the wrongdoings of a British Imperialist is more challenging than condemning a genocidal foreign dictator because it casts an 'unbearable searchlight of complicity' (Tuck & Yang, 2012) on everything most of us were brought up to be proud of. Simultaneously, there is a fear of opening the floodgates (Stemplowska, 2021): if one statue is removed, *all* cultural heritage becomes subject to potential challenges and with it, established claims to national pride, identity, and belonging are under threat.

Proportionate to its major role in Modern colonialism, Britain struggles with calling its Imperial glory in to question (Gildea, 2019). Consequently, there is a cultural prevalence of 'nostalgia and amnesia' (Goodfellow, 2019), in which 'the very history which made Britain "Great" is disavowed, externalised and projected onto its (European) enemies – portraying itself as the victim rather than the perpetrator of imperial violence' (Koram, 2017). This translates to overt denials of historical facts, the silencing of factual information, and an ignorance of how intrinsically the reverberations of colonialism are embedded in contemporary life.

In the midst of the re-ignited *Rhodes Must Fall* (RMF) protests of 2020, for instance, contrarian Oxford professor Nigel Biggar claimed that Cecil B. Rhodes, subject of a contested statue at Oriel College and namesake of the prestigious Rhodes scholarship, 'was not racist' (Biggar, 2020). This is hard to comprehend in light of Rhodes himself stating that White British people are 'the supreme human race' (Magubane, 1996), and the fact that he used this belief in superiority to initiate apartheid in Southern Africa (Castle, 2016). While Biggar is arguably an outlier within this realm of scholarship, denial is an all-too-common deflection strategy in facing the present reverberations of colonial legacies (Gildea, 2019). Below outright denial, there are several nuances of intentional ignorance (Ortega, 2006) towards the realities of spatial Coloniality. The National Trust experienced this in 2020, when they published a report of factual information on its own properties' ties to slavery (Bailey et al., 2020). Despite this report's proclaimed aim for acknowledgement, not demolition, they were reprimanded for endangering and 'politicising' British heritage, and threatened with the withdrawal of governmental funding (G. K. Adams, 2020) by the then-Secretary of Culture.

The underlying assumption of such an accusation is that heritage is not inherently political to begin with. Most scholars who research spatial histories would disagree with this assumption (Cherry, 2006). Richard Drayton (2019) and William Cohen (1989), for instance, frame built heritage, such as statues, as symbols of power which allow elites to present their values to future generations. Therefore, before asking who we would like to see represented in our public spaces, we must look closer at who, in the past, made the choices which shaped our present environments. Based on who they were, what they believed in, and how they financed their endeavours, do present and future generations owe these past elites protection of their symbols in perpetuity?

This chapter will use the Rhodes statue at Oriel as a case study to explore these questions spatially, through the lens of virtual histories. The Rhodes statue's role as a national lightning rod of decolonising discourse, as well as its ongoing embroilment in a large number of political controversies, provide one half of the source material. The other half focuses on the person depicted by the statue, Cecil B. Rhodes. This includes his role in founding De Beers, a diamond company which until quite recently held a monopoly on the international diamond market; the establishment of Rhodesia (present-day Zimbabwe and Zambia); the introduction of systems of structural oppression in Southern Africa; the construction of the telegraph system across the African continent, the Rhodes Scholarship, and his inheritance to Oriel.

This chapter aims to connect the person of Rhodes to what he signifies in present media discourse: issues around institutionalised racism, inaccessibility of higher education, tuition fees, and prevailing pro-Imperialist sentiments which disregard those who continue to suffer from colonial violence. Thereby, this chapter seeks to demonstrate that any statue, square or street corner holds the potential to alter how we engage with political change and social justice. We need only be willing to look.

A Short History of Rhodes

The Man

Cecil B. Rhodes was born in 1853 in Bishop's Stortford, Hertfordshire, and sent to South Africa as a teenager in hopes of improving his poor health. He entered the diamond trade, and eventually founded both De Beers and the Royal South Africa Company, which was modelled after the British East India Company (Slinn, 1971). As a political personality of significant local influence, he brutally oppressed and exploited large portions of Southern Africa (Nelson, 2020), massacred indigenous populations (Godwin, 1998), and laid the legal foundations for apartheid in Southern Africa (Srinivasan, 2016). He annexed indigenous lands to found Rhodesia, named after himself, and became president of the Cape Colony (present-day South Africa) in 1890. He used his political position to systematically disenfranchise the Black population (Dowden, 1994) and in 1895, initiated the catastrophic Jameson Raid which led to a domino-effect of violence across the British-occupied African territories (Hammond, 2012). As Gilbert Keith Chesterton (Maylam, 2005) stated in 1912: Rhodes 'invoked slaughter, violated justice, and ruined republics'.

Prior to this notoriety, in 1873, he studied at Oriel College, Oxford, for one term. This became crucial in his final years, when he sought to launder his dismal reputation back in England (Drayton, 2019). In his final will, written in 1899, Rhodes left a sizable donation (£100,000, the equivalent of ~£15 million in 2023) to Oriel College, which allowed them to build the *New Building*, presently called *Rhodes Building*. His will did not stipulate a memorial to him, but that the money should be used to support the college's maintenance, construction plans, and 'the dignity and comfort' of the high table (Maylam, 2016).

Additionally, he set up the Rhodes Trust to finance the Rhodes Scholarship, which provides 102 graduate students at Oxford with full funding every year. Defenders of Rhodes cite the fact that since its inception, the Rhodes Scholarship has been open to people of all races as an argument to support the claim that he was not as discriminatory as his own writing states. The consensus amongst Rhodes historians, however, is that the clause

against discriminating on the basis of race was referring to a English/Dutch racial divide (Day & McKenna, 2023), and that he could not have fathomed a future in which non-White students would attend Oxford (Schaeper & Schaeper, 2010). Furthermore, Rhodes explicitly stipulated that women should be excluded from the scholarship and that only unmarried men who excelled at ‘manly’ outdoor sports should be eligible (Day & McKenna, 2023).

Rhodes died in 1902 and was buried at Malindidzimu⁵ in Zimbabwe along with several other colonial public figures and officers.

Despite being deeply controversial in his own time, Rhodes long enjoyed a ‘symbolic status in the Victorian pantheon of empire-builders’ (Newbury, 1981). As the metaphorical giant whose feet sought to stretch across the entire African continent, his overseas fortunes inspired many an aspiring Imperial entrepreneur. Colin Newbury (1981) argues that the persistence of ‘eulogistic and persona-centred’ narratives on Rhodes conceal the significant influence of the institutions through which he worked, and the larger structural changes in capitalist enterprises which were taking shape at the time.

In protests which emerged in Oxford in 2015, and again in 2020, this connection between Rhodes and the exploitative institutional systems he was a part of became the centre of attention. Rhodes was not seen as a beneficent of capitalist colonial extraction, but as a symbol for systems which continue to create and proliferate socio-economic inequalities and White supremacist ideologies.

The Statue

£40,000 (~£6 million) of Rhodes’ donation to Oriel was designated for the construction of a new building on Oxford’s High Street (Oxford and Empire, 2021). The *New Building* was erected between 1909-1911 and stretches from Magpie Lane to Oriel Street. Seven older houses had to be demolished to make room for the new college building, which was not looked upon kindly at the time (Sherwood, 1927).

The Rhodes statue is positioned above six other, life-sized statues – two kings and four provosts – and was made the same sculptor (Alfred Bertram Pegram) who also made the Cape Town Rhodes sculpture (Muir, 2013). The Latin inscription below the statue reads *E LARGA MVNIFICENTIA CAECILII RHODES*, which translates to *By means of the generous munificence of Cecil Rhodes* (Jenkins, 2022). The letters which appear larger than the rest – LMVHICCCILIID – may be rearranged in descending order to create MDCCCLLVIII, which equals the shorter MCMXI, to indicate the Year 1911 in Roman numerals (the year the sculptures were added to the façade). The North Range of the *Rhodes Building* has been Grade II* listed since 1972.

Chigudu (2021) argues that the statue ‘perfectly distils ... imperial nostalgia into a concrete object’. Until the emergence of decolonial scholarship, criticisms of the statue’s presence were not formally or publicly articulated. And yet, as K. Murris states, its presence casts ‘a shadow on black and other students alike..., who struggle to identify with, an institution that harbours a statue immortalising a British Imperialist’ (Murris, 2016). This sentiment became the subject of national debate in 2015, in the wake of the *Rhodes Must Fall* (RMF) movement.

Earlier that year, student-led protests under the banner *Rhodes Must Fall* at the University of Cape Town (UCT), South Africa, led to the removal of their Rhodes statue from campus within a week, by the university.

⁵ A place considered sacred in what is nowadays the Matobo National Park, Zimbabwe.

Having emerged from *Fees Must Fall*, a longer-standing effort to make higher education in South Africa more financially accessible, especially for Students of Colour, this was seen as a sign of willingness to tackle a ‘broader transformation of the university’ (activist Kgotsi Chikane as quoted in (Boroughs, 2015)). In Oxford, a local RMF movement was, in contrast, met by resistance from Oriel College, the university administration, the government, and several public figures. Arguments against the removal of the Oxford Rhodes statue heavily leaned on downplaying Rhodes’ historical relevance (Godwin, 1998), diminishing the impact of British Imperial violence (Gilroy, 1997), and denying Rhodes’ White supremacist views (Biggar, 2020).

Oriel College erected a plaque close to the statue which stated that ‘many of Cecil Rhodes’ actions and public statements are incompatible with the values of the College and University today. In acknowledging the historical fact of Rhodes’s bequest, the College does not in any way condone or glorify his views or actions’. At the time, however, the college chose not to remove the statue because alumni donors threatened to withdraw over £100 million in donations if they did (Mortimer, 2016).

It was only in response to the Black Lives Matter (BLM) protests of 2020, which, in Oxford, physically centred around the statue, that Oriel College reconsidered its response. After internally voting on the issue and hiring an external commission to examine this choice, the college stated that they would begin the legal processes necessary for removing the statue from their Grade II-listed building (Mohdin et al., 2020). However, following external pressures, Oriel released a statement a few weeks later declaring that they ‘carefully considered the regulatory and financial challenges, including the expected time frame for removal, which could run into years with no certainty of outcome, together with the total cost of removal’ (Oriel College, 2021) and chose to keep the statue where it is.

Reactions were mixed: RMF activists, BLM protesters, and most residents were upset by this retraction of their commitment to change (Chowdhury, 2021; Mohdin, 2021; Race, 2021). The Oxford City Council voiced their disappointment at Oriel’s decision, further widening the well-established divide between townspeople and university members (Oxford Council, 2021). After all, non-university residents are subjected to the statue’s presence too, and they get even less say in what happens to it than students or staff members do.

Then-UK Education Secretary Gavin Williamson, in contrast, called the decision ‘sensible & balanced’, with the justification that ‘we should learn from our past, rather than censoring history’ (Mohdin, 2021). This statement blankly disregards that keeping the statue is a form of censorship, too: it silences those marginalised by Rhodes’ ideologies. By building a statue, a statement is made about which members of our society are valued, and, in this case, deserve to hover above residents’ heads every day like saints. By keeping and maintaining a statue like this, we validate and perpetuate the values which put it on its plinth in the first place. In the following, we will explore how historical narratives may be operationalised to not just affirm or silence, but actively question and contextualise these values.

Approach

Virtual Histories

Virtual histories, or speculative histories, extrapolate a timeline in which certain historical events did not

happen (or had a different outcome) in order to accentuate the decisions which did, in fact, make them occur (Bradley & Cowley, 2001). They conjecture on ‘what did not happen, or what might have happened, in order to understand what *did* happen’ (Black & MacRaild, 1997, p. 127). It is a contested approach amongst historians, and rightfully so. If applied in bad faith, they can distort or misrepresent historical facts (O’Gorman, 2006), and at worst, support ludicrous counterfactual narratives in political debates. However, if applied responsibly, there is significant educational value in asking ‘What if...?’.

Firstly, historians who employ virtual histories as a narrative tool argue that they counteract deterministic historiographical traditions in which historical circumstances are presented as ‘cosmic forces or gravity’ (Hacking, 1990, p. 131). A prominent example of this tradition is the famous passage from David Lloyd George’s *War Memoirs* (2001, p. 43) which states that in 1914, the nations of Europe ‘slithered over the brink into the boiling cauldron of war’. It implies that the beginning of WWI was not the result of choices made by individuals who could have chosen differently, but due to a ‘cosmic gravity’ beyond human influence (Hacking, 1990). In contrast, a virtual history approach to the same narrative might point out Lloyd George’s own central role in governing Britain into WWI, and the choices available to him and his ministers at the time. Thus, virtual histories draw attention to the selective nature of historicising.

As Howard Zinn (2015) argues, historical writing cannot avoid some degree of emphasis, simplification, and selection, but it must acknowledge the interests – be they economic, political, racial, national or sexual – which guide the writer’s agenda. Otherwise, historiographical narratives are falsely framed as neutral representations of historical facts which cater to the presumed universal needs of an audience. Further, virtual histories echo how we make choices in our lives, by weighing ‘the relative probability of plausible outcomes’ against one another (Ferguson, 2011). This distinguishes them from *historical fiction*, which provides a ‘sentiment of history’ by placing fictional narratives within a factual historical context (Butterfield, 1981) and *alternative history*, which comprises historical ‘What if...?’ scenarios in fiction writing⁶. Both are categories of literature, not historiography. Crucially, virtual histories are also not *fact denial*. On the contrary: they do not call into question factual events, but allow us to relate to them differently by accentuating how arbitrary, flawed, and ultimately human the shifting sands of our collective pasts are. As William Thompson (W. Thompson, 2010) states, ‘contemplating what might have been gives us all the more reason to pay attention to what *did* transpire’.

Doreen Massey (2005) argues that opening ‘the imagination of the single narrative to give space (literally) for a multiplicity of trajectories’ is also an philosophical shift which signifies a refusal ‘to convene space into time’ (p. 23). This fits with the approach of this paper, which uses neither of the two established virtual history formats, (a) the expanding and (b) the contracting models, respectively. Most contemporary virtual histories either (a) fan out a variety of scenarios based on one change of events (e. g. possible European futures if WWI had never happened) or (b) suggest various turning points which might have led to the same outcome (e. g. numerous decisions and circumstances which could have prevented WWI). While these two formats are effective in writing, my virtual histories focus on a *spatial* location, which requires a different set of considerations.

Roads Not Taken

My approach is based on an exhibition at the Deutsches Historisches Museum (DHM, meaning *German*

⁶ A prominent example of this is *The Man in the High Castle* by Philip K. Dick.

Historical Museum) called *Roads Not Taken* (2022-23). Instead of applying an expansive or retractive model, the curators presented an accumulative series of choices over time, effectively unthreading the fabric of German history. They do not offer five different ways in which the fall of the Berlin Wall could have played out. Neither do they suggest a myriad of scenarios which would have all led to WWII being prevented. Instead, they begin with the protests which led to the fall of the Wall in 1989 and offer one alternative – the brutal retaliation of East German (GDR) military forces against protesters. Given that the GDR government voiced its support of the Chinese government’s actions in Tiananmen Square just weeks before (Shen, 2019), this was not an unlikely scenario at the time, the exhibition argues. They do not, in this instance, offer any counterfactual contingencies to this scenario.

The next example reaches further back in time, discussing Cold War politics between East and West Germany and how the infamous Warsaw Genuflection could have just as easily not taken place, indicating a radically different Eastern Policy on part of the West German government under Willy Brandt. From scenarios in which a nuclear bomb is dropped on Germany during World War II to the Great Depression Era government following an alternative to Austerity, the thread of German history is slowly unravelled as the exhibition sequentially dives deeper and deeper into time, until Germany has never become a republic, never became a kingdom, and eventually, has never existed at all. The scenarios presented along the way are not contingent on one another, and some exert more speculation or judgement than others.

For instance, the scenario of a successful assassination of Hitler in 1944, in what is now known as the 20 July Plot, is contextualised by statistics of civilian, military and Jewish death rates throughout the war years. This contextualisation is underlined by *TOO LATE?* in giant lettering (both in English and German) on the opposite wall. The information panels suggest that if the plot, conducted by high-ranking Nazi officers under the leadership of Colonel Stauffenberg, had been successful, it would have saved most soldiers and civilians living in the Third Reich at the time, but most of the Jewish population had already been murdered by 1944. Thus, the plot came too late to prevent some of the worst atrocities committed by the regime and might have, once the officers had formed a new government, lead to perpetrators staying in power. This was one of the more pointed contextualisations and effectively illustrated the persuasive power and potential dangers of virtual histories. Crucially, *Roads Not Taken* does not only apply virtual histories in text but has experiential and spatial components.

Limitations

Virtual histories come with significant challenges in terms of retaining their educational value, clearly identifying deviation points from factuality, and conveying transparency about the assumptions which factor into speculation. As this case study will illustrate, a choice of appropriate scale is crucial: tying the entirety of British Imperialism to the statue of Rhodes, for instance, might over-inflate his importance in this centuries-spanning *macronarrative* (Mignolo, 2002). Only focusing on his person, in contrast, might diminish the significant symbolism he embodies contemporarily. One-(wo)man narratives are an established tool in virtual history writing (Ferguson, 2011), but they risk pinpointing the fate of the world on one person’s actions, disregarding the social and political climate of their time.

Similarly, pivot points describe major events or drastic changes that are, in hindsight, narrated as quantum leaps of history. In virtual histories, pivot points are used as anchors for subsequent speculation, further affirming

their centrality. This case study mitigates this by focusing on key issues related to controversies surrounding the Rhodes statue, rather than the statue itself. This means that it omits who was hired to design the Rhodes Building, or where the stones the statue is made of came from, in favour of political issues which relate to Rhodes Must Fall, Fees Must Fall, and decolonial efforts in Britain. The following analysis focuses is on events in Rhodes' lifetime which relate to these movements, and the repercussions of his actions. I do not view the following as a comprehensive iteration of what virtual histories of the Oxford Rhodes statue may comprise, but as a starting point which other researchers can expand upon. The subsequent case study is, similarly, just one iteration of what an XR interaction based on this analysis and this space could be, rather than a definitive iteration of what could – or should – have happened.

Rhodes to Nowhere: A Virtual History

2024: Present

We shall start in the present: if Oriel removed the statue today, what repercussions could we imagine?

Presumably, every news outlet in the country would write about it and all the voices which have publicly



chimed into the debate previously would reiterate their – likely unchanged – views. While new Secretary of Culture Lisa Nandy has announced artefact restitution to origin communities as ‘on the agenda’ (Harris, 2024), the Labour government has thus far not announced any changes to the previous government’s *Retain and Explain* policy. It is therefore difficult to conjecture whether a governmental response would be positive, or, in line with past interference and statements issued by the previous Tory government (G. K. Adams, 2020; Mohdin, 2021; Syal, 2021), negative. Meanwhile, the university would likely support Oriel’s decision, since they did invite

dialogue with *Rhodes Must Fall* protestors to begin with (University of Oxford, 2021) and only rarely interfere in college-based decisions. Moreover, it would be difficult for the university's PR team to justify Oxford not supporting a decision which aims to promote tolerance, inclusivity, and a forward-facing approach to dealing with its histories. Individual university members, however, might criticise the decision as the university caving to woke-ism. Given the well-established narratives on both sides of the cultural divide around the statue, the removal would certainly remain a contested topic at formal dinners for years to come.

Political Implications

When considering the potential political repercussions of removing the statue, it is vital to reflect on the role Oxford plays as one of the oldest, most prestigious, and highest-ranked educational institutions in the world. While the removal of the UCT Rhodes statue did have an impact on analogous student movements elsewhere, Oxford inhabits a different role on the international stage than UCT. Its position as a prototypical European university suggests a greater influence on other Western institutions. Especially universities which are directly competing with Oxford, such as Harvard or Cambridge, might feel more pressure to address their respective ties to coloniality and how they presently deal with them. Thus, it is not unreasonable to assume that were Oriel to remove the statue, other universities might feel pressure to follow.

This only applies, however, if one considers the Rhodes case as central to the wider discourse on decolonising institutions in the UK and assumes the removal would be followed by an avalanche of media coverage. If one views Oriel's Rhodes as one of many contested statues in Oxford, and one of the many university-owned contested spaces, the removal might be conducted relatively quietly. After all, the Codrington Library was renamed without much fanfare (A. Wood, 2020) and it is possible that the university would treat the removal of Rhodes as an outlier, rather than indicative of their future directionality. However, the Codrington controversy was not nearly as widely publicised as Rhodes, and after all the articles, books, and news reports about whether the statue should stay or go, it does not seem likely that it would go quietly.

This touches upon another central consideration: it matters *how* the statue is removed. If it were to quietly disappear overnight, with a statement issued and no further fuss about it, the implications would be radically different than if Oriel announced its decision, put forth a call for students or residents to vote on what should go in Rhodes' place (if anything) and made its commitment to critically dealing with its past a core pillar of its college identity. It could affect hiring practices, admissions, its standing within the university, and its connections to other universities. It could be a potential opening to foster more community engagement within Oxford, and to be a positive example of how the requests articulated by the Oxford RMF movement might be met by institutions. Ideally – from an RMF supporter's perspective – it would motivate other governing bodies with ties to Rhodes to reconsider their positions, and re-open the discussions around fees, access, and inclusivity that RMF has always been about.

Given Oxford's central role in shaping Britain and its policies in the past, this influence might ripple into wider societal circles. However, organisations like the Rhodes Trust are unlikely to detach from their name-giving donor on the grounds that their international recognition outweighs that of Rhodes as a person (Rhodes Trust, 2020). Similar arguments have been used by Yale University (Am et al., 2020; G. Wood, 2020), for instance, which indicates that a highly publicised move on Oxford's part is not necessarily going to translate to a tidal wave of

change at other universities. It would be a starting point and could, with a different future governmental direction, become highly influential, but might just as easily be a performative act which does too little, too late. There is also potential that other universities might take an opposing stance, to potentially gain conservative donors who no longer want to back Oxford.

In 2021, then-Cultural Secretary Oliver Dowden threatened museums and heritage institutions with funding cuts in the wake of the National Trust report (Syal, 2021). Even though the current UK government may eventually follow a different policy path, currently, the direction set out by the previous government is still in place, and it is possible that there would be policy consequences to prevent other institutions from following in Oriel's footsteps. Following the 2020 protests which saw the Colston statue in Bristol being torn down by protestors, and many others vandalised, the then-government passed a new bill which increased maximum sentences for vandalising statues (Thomas-Symonds, 2021). In 2022, a Rhodes plaque on another side of Oriel was put under Heritage Listing protection to curb future debates of removal (R. Hall, 2022). It is thus not unthinkable that if the Rhodes statue was removed, it would prompt other sculptures of comparable notoriety to be better protected and more firmly retained in the future. This is, however, contingent on the current government's future policy line.

Monetary Implications

Oriel, like most other Oxford colleges, currently rely on funding from private donors. The political nature of the removal might have spurred donor behaviours in either direction: withdrawal from donors who oppose the removal, and an influx of funders who support the college's decision. The latter appears particularly likely for foreign donors who wish to promote more diversity at Oxford, non-White donors, and donors who belong to centre/left leaning political parties. Regardless, it is uncertain what the balance between losing established donors and gaining new support would have meant for the college's finances. In 2020, tech-entrepreneur Husayn Kassai offered to make up for whatever funding other alumni would pull from Oriel (Quinn & Adams, 2020). It is unclear, however, how committed this statement was.

Stepping slightly outside of the realm of the well-established routes by which Oxford colleges finance themselves, the political nature of the removal would open possibilities of finding new funding sources. For smaller purchases, such as new rowing boats, most Oxford colleges already run crowd-funding schemes. If Oriel leaned into a narrative of not wanting to have its choices dictated by the whims of conservative private donors, it might evoke significant public support. However, this would likely function as a PR campaign to then attract other private or industry donors, rather than a sustainable way of replacing the lost funding going forward. Firstly, given that BLM UK raised £1.2 million following the protests in 2020 (Mohdin & correspondent, 2023) – and their much larger US equivalent \$90 million (Kulish, 2022) – it appears unlikely that £100 million could be sourced from crowdfunding. Especially amid a cost-of-living crisis and rising inflation, donations from the public do not present a likely solution.

Secondly, if the organisations which saw a boost in funding post-2020 are any indication, this would be a one-off showing of public support, rather than a sustainable, long-term funding model (Müller et al., 2021). It is likely that Oriel would have to put itself at the behest of another set of influential donors. Given the college's history, prestige, and significant athletic prowess, it seems improbable that they would not be able to secure funding at all. However, they might, in a worst-case scenario, find themselves in a similar situation to that of Linacre College in

2021, which controversially intended to change its name to honour a major donation (Gayle, 2021; Trybull, 2023), which is, in principle, what got Oriel into their present situation to begin with.

Additionally, there are costs for the physical removal, legal fees to fight for the statue to be removed despite its Grade II listing protection, and potentially funding to have a new sculpture put in Rhodes' place.

Spatial Implications

There has been ample debate about what should go in Rhodes' place if the statue was removed. Prominent former Rhodes Scholar Ann Olivarius, for instance, suggested that a statue of Alain Locke, the first African-American Rhodes Scholar, could replace Rhodes, or a sculpture of Zambian activist Lucy Banda-Sichone (Olivarius, 2020). Interestingly, renowned RMF activists have not been vocal about alternative suggestions, solely focusing on Rhodes being removed (Chantiluke et al., 2018).

There have been concerns, however, that a removal without replacement might aid forgetting (Stemplowska, 2021). This could further the already prevalent collective amnesia in relation to colonial violence, and the persistence of funding generated from colonial exploitation. As a suggestion to mitigate this issue, British sculptor Anthony Gormley suggested that the statue could be turned around to face the wall, as 'an acknowledgement of collective shame' but also to 'reassert to Oriel College and many institutions have property from Rhodes's riches' (Gayle, 2021). It seems, however, that this is a solution which would satisfy neither side of the cultural divide: for Retainers, this would assert that Rhodes' legacy is something to be ashamed of, which they mostly disagree with; for RMF activists, keeping the statue in any form would perpetuate the symbolism of the university valuing Rhodes and what he stands for. Thus, if Oriel was to take action today, it seems unlikely – and perhaps unwise – that they would choose this option.

There is a long tradition of public-facing statues in Britain being commissioned based on a contest in which sculptors can put forward their proposals (Coutu, 1993). In the context of the Rhodes statue, this presents an opportunity to not only make a political statement, but to engage the local community in reimagining a space they share, but have thus far had no influence over.

Where Rhodes Used To Be could also offer an opportunity for ongoing artistic and critical engagement, akin to the fourth plinth in Trafalgar Square in London, which hosts temporary sculptures by varying artists.

Irrespective of who or what replaces Rhodes, however, some form of permanent acknowledgement is needed. If one does not support the claim that statues educate through their mere presence, one can hardly claim that their absence does. Also considering that this has been their solution approach thus far, it seems likely that Oriel would replace its current plaque with one which explains the motivations behind their choice.

This chapter's prototype study will experimentally engage with the options of what or who could replace Rhodes at the front of Oriel College.

2020/21: Black Lives Matter

If Oriel had followed through with its intention to remove the statue in 2020/21 (Oriel College Commission, 2021), the cultural impact of this choice would have likely played out differently than if they removed it now. At the time, RMF activists were sceptical whether the college would follow through, but still regarded this as a

‘substantial shift in their position’ (Mohdin et al., 2020). Thus, the legitimacy of the university’s commitment to ‘addressing systemic racism wherever it may be found, including within our own community’ (University of Oxford, 2020) would have been supported by this choice. It would have likely accelerated the process of other contested spaces within the university to be removed or renamed, and would have presented a material legacy of 2020’s BLM protests.

A central question is where we could be right now if this shift had happened. At the time, there was hope that Oriel’s decision would present a ‘turning point’ which would prompt other institutions to follow the college’s lead and ‘take down statues of slave traders and white supremacists’ (Mohdin et al., 2020). Had this taken place, our shared spaces in the present might be less dominated by colonial iconography. Crucially, these changes would have signified to future movements that mass protests have material impact, and that institutions, especially those facilitating education, stand by their word once they make a decision.

Political Implications

When Oriel announced its intention to remove the statue in 2020, several individuals within the university voiced their support, and some other colleges internally voted on their stance regarding the statue, with the result that they thought it should be removed (Mohdin et al., 2020). Therefore, it appears likely that there would have been little pushback on the side of the university at the time. As aforementioned, this might have prompted other universities to follow suit, perhaps more likely so than in 2023.

The backlash against this choice, and subsequent legislation to make it harder for institutions to remove colonial statues or plaques, however, would have likely been more pronounced as well. In 2020, Oriel also committed to removing the Rhodes plaque on King Edward Street, which has now been placed under heritage listing protection (R. Hall, 2022). The fact that then-Culture Secretary Nadine Dorries overrode the decision by Heritage England, which had deemed the plaque not worthy of preservation, is indicative of the politically motivated choices which would have likely followed the removal of the Rhodes statue at this point in time.

Monetary Implications

In 2020/21, the monetary challenges faced by Oriel would have been similar to what they would be if they removed the statue today, but had they done it in the immediate wake of BLM, cultural momentum would have been on their side. Perhaps not as many alumni donors would have followed through on their previous threat to withdraw funds. Even if they did, others might have stepped in (Quinn & Adams, 2020) or crowd-funding might have given them a starting point for a new fundraising strategy.

Additionally, there would have been monetary implications beyond the physical removal of the statue. The Oxford City Council, for instance, conducted a vote at the time which determined the Rhodes statue should be placed in a museum after its removal, akin to the Colston statue in Bristol (Harris, 2020). Whichever museum would have been chosen would have likely curated a special exhibition around the statue, and would have been impacted monetarily in terms of visitor numbers and donations.

Spatial Implications

The question of what would have replaced Rhodes in 2020 evokes similar answers to 2023, but it seems likely that the choice would have been more directly related to BLM. This could have affected the depicted person, the

maker commissioned to produce a new artwork, or both.

The Rhodes plaque, now under heritage listing protection, would no longer be in its original place. It is open to debate whether it would have been replaced with a different plaque, or an acknowledgement of the controversy around its removal.

2015: Rhodes Must Fall

If Oriel had responded directly to Rhodes Must Fall Oxford, and followed UCT's example of removing the statue immediately, public reactions would have likely altered significantly from reactions in the present or in 2020. The political climate in 2015 Britain, pre-Brexit, was starkly different, and just a year after the failed Scottish Independence referendum, there was palpable conservative concern over protecting what is British, and maintaining things as they used to be (Rai & Campion, 2022).

Political Implications

2015 was one year before the Brexit referendum, and nationalist rhetoric to support the departure from the EU was in full swing. Future US president Donald Trump was on his campaign trail, effectively lowering the bar for the amount of racist, sexist, and xenophobic remarks that were acceptable for a prospective government official to utter on live tv or on Twitter. It seems likely that if an institution like the University of Oxford had assumed an anti-colonial stance in 2015, the 'war on wokeness' would have dug out its trenches earlier, and White nationalist sentiments would have risen even more divisively in the UK (Davies & MacRae, 2023). Similarly, legislation to prevent the removal of statues might have been passed earlier, prompting the protestors of 2020 to be punished more severely than they were (AFP, 2022).

Monetary Implications

A significant portion of Oriel's funding would have likely been withdrawn, as threatened, with few avenues to replace it. In 2015, the likelihood of alternative donors stepping to support the college's decision was lower, albeit possible.

Assuming a starker political backlash against the decision, it is additionally possible that legislation might have been quickly passed to make the removal of the statue more costly to the college, or that their request to have it removed despite being listed would have been blocked at ministerial level.

Spatial Implications

In terms of the removal and potential replacement, similar considerations apply to the 2023 scenario. A crucial difference, however, is that if the statue had been removed in 2015/16, the BLM protests of 2020 would likely not have centred around Oriel but focused on a different contested locality within Oxford. This might have put a different coloniser at the centre of the following public discourse, and moved Rhodes into a more obscure echelon of public memory.

2011: The Centennial

Rather than reacting to the external pressure of protests, Oriel could have removed the statue on its own volition. The centennial of its construction presented an opportunity for the college to critically reflect on its past and its links to Rhodes, and choose a new direction going forward.

Political Implications

Decolonial activism might not have become central to public media discourse in Britain until 2020, but within academia, it has a decades-spanning, active history (Rai & Champion, 2022). If Oriel had taken the centennial of their spatial expansion on High Street to direct themselves onto a different trajectory for the future, this could have been a landmark move, unprecedented by other elite universities. While this might not have led to a tidal wave of change across Western institutions, it would certainly have put Oxford in a better position once the cultural moment for decolonial change emerged in 2020. Instead of operating reactionarily, they could have laid action-based claim to being a forward-thinking, inclusive learning environment ahead of the curve.

The University of Cape Town (UCT), having a direct relation to Oxford's Rhodes statue (which was made by the same artist in the same year), might have been prompted to follow this lead and take down their statue, too. If not on their own volition, there would have likely been student protests who would have inclined them to do so. Subsequently, Fees Must Fall might have never become Rhodes Must Fall. However, Fees Must Fall would have likely still underlined links between present capitalist exclusion in higher education and the institutions' entrenchment in colonial ideologies. Rhodes, however, might not have been a central example in that discussion.

Monetary Implications

Given that the UK government had just committed to a highly-controversial tuition fee raise (P. Bolton, 2010), effectively de-funding universities, removing the statue in 2011 would have likely been seen as an anti-governmental stance. Rhodes was astutely pro-British and acted as an extension of the British government in his time. Instead of identifying itself with Rhodes and the university's colonial history, removing the statue at this point would have pointed the proverbial finger at the government instead. This would have likely temporarily soured the well-established link between parliament and the university. Alumni donors would likely have withdrawn significant funds and Oriel would have been left with little support on side of the government to make up for its losses. However, this might have heralded a different focus for attracting donors earlier on, giving the college an opportunity to turn its colonial history into a decolonial future identity ten years before the rest of the country started to focus on the realities of structural racism. In the long run, this might have benefitted Oriel's funding strategy, and established them as a future-oriented college, rather than one prone to Empire nostalgia.

Spatial Implications

Neither RMF protests in 2015 nor 2020's BLM protests would have been likely to take place at Oriel. The question of what should go in Rhodes' place might have been less prevalent in 2011 and the statue might have been removed relatively quietly, leaving an empty plinth and no explanation.

1991: End of Apartheid

When Apartheid in Southern Africa formally ended with the repeal of its underpinning legislation in South Africa in 1991 (The Southeast Missourian, 1991), Oriel could have chosen, as a symbolic gesture, to take down its Rhodes statue.

Political Implications

While Britain participated in sanctions against South Africa to pressure the country into abolishing Apartheid (Goulbourne, 1991), they primarily pursued their own economic interests at the time when Apartheid formally ended (Barber, 1991). Thus, it appears likely that the government under John Major would not have appreciated the overt pointing out that the groundworks for Apartheid were laid by a Briton. In contrast, relations between the University of Oxford and UCT might have been strengthened through this move much earlier on.

Monetary Implications

Similar to the 2020 scenario, it appears likely that in 1991, some donors would have withdrawn their funds, but many would not have, in fear of appearing pro-Apartheid.

Spatial Implications

While the removal would have likely caused a media frenzy, it seems improbable that it would have led to other colonial statues being removed, or for there to be a wide-spread debate over what should replace Rhodes. Eventually, a replacement might have been chosen in relation to the end of Apartheid in South Africa, and a central figure in this struggle, such as Nelson Mandela, might have been a candidate to replace Rhodes.

Further, it seems unlikely that this removal would have been seen as so politically significant that the statue would have been moved to a museum. Perhaps Oriel would have hosted a fundraiser in which they auctioned off the statue to the highest bidding donor. It is, however, just as likely that they would have gifted it to one of the university's museums, where it would have disappeared into the oblivion of the back-of-house collection.

1979: Zimbabwean Independence

Similarly to the End of Apartheid scenario, Oriel had an opportunity to make a political statement to support decolonial movements when Southern Rhodesia became independent as Zimbabwe in 1979 (Mlambo, 2014).

Political Implications

Given the anti-immigrant line of the British commonwealth policies under Margaret Thatcher (Reitan, 2003), it seems unlikely that the British government, media, or public would have reacted favourably to this removal. At the time, Zimbabwe's independence was seen as the loss of another colony, and Rhodes personal ties to the country, plus the direct connection to the renaming of the country, would have likely been viewed as anti-British.

Monetary Implications

Assuming this would have been a controversial and surprising move at the time, it appears likely that Oriel would have lost significant amounts of funding with little options of recuperating. As a result, they would probably

have struggled financially for decades to come.

Spatial Implications

As with the End of Apartheid scenario, public discourse would have likely been less focused on whether Rhodes should be replaced, or what should happen with the statue. Eventually, a replacement might have pointed towards the political circumstances of its removal.

1964: Zambian Independence

Analogously to the previous two scenarios, in 1964, when Northern Rhodesia became the independent nation of Zambia (Gewald et al., 2008), and the British Southern African Company, which Rhodes had founded, ceased to exist, Oriel could have taken down the statue to make a symbolic statement.

Political Implications

Political repercussion would have probably echoed those of the previous scenario, but likely worse, since open segregation and overt institutional racism were still the global norm (Mbughuni, 2014).

Monetary Implications

Monetary implications would also have echoed the previous scenario, but more severely, as Oriel would have been financially disadvantaged earlier. On a national scale, the loss of mining rights in Zambia had significant economic impact in Britain.

Spatial Implications

It is possible that rather than being framed as a location of liberation from colonialist legacies, the plinth where the Rhodes statue once stood would have been politicised as a site of violence against British legacy, and would have been turned into a locality of protest, years down the line, polarly opposed to that of the reality we know.

1911: No Statue

Jumping back to Rhodes and his connections to recent issues, there was the option, in 1911, for Oriel to cave to public opposition against a statue of Rhodes being erected in the first place (Drayton, 2019). Thus, the statue would have never been erected.

Political Implications

Given that the commission of a statue was not part of the stipulations in Rhodes' will, not erecting the statue would have likely had few repercussions outside of the college. Perhaps it would have slightly improved local Town/Gown interrelations.

Monetary Implications

Not erecting the statue at this point would have had little to no impact on Oriel College, unless future donors felt them not putting up a statue of Rhodes due to public pressure was an act of disrespect towards a central donor, and did not trust them to govern their donations responsibly (especially posthumously).

Spatial Implications

There would likely be a different statue in the space of Rhodes, and different lettering underneath. Alternatively, the entire front of the building might have been designed differently.

1902: No Donation

Rhodes could have never donated to Oriel, only reserving some of his inheritance for the Rhodes Trust.

Political Implications

Oriel would have had little association with Rhodes and the controversies he was embroiled in beyond him being a famous alumnus. In the long run, this would have put them into a much less controversial political role.

Monetary Implications

Oriel would have been in a significantly worse financial position, although it is difficult to conjecture how they would have secured alternative funding. Historically, Oriel has never lacked donors, and their welfare as a college does not and has never hinged on one donor.

Spatial Implications

Oriel would not have been able to build their New Building, or at least not as quickly, and with different funding. Without Rhodes' donation, it might now bear the face of a different donor and carry a different name.

Reflection

The further back we reach, the blurrier the visions of possible futures become. There were so many obstacles in the way that the removal of the statue prior to more recent cultural shifts feels more and more improbable. If the British government had not even ceased many of their colonial territories elsewhere, what chance could protests against a statue of one colonist have?

Removing the Rhodes statue, however, is not the only possible scenario which illuminates some of the past choices available, and how they tie into our present realities. Instead of focusing this analysis on the statue at Oriel, it could have also been applied to circumstances of Rhodes' life, or movements connected to the controversy engulfing the statue.

One of these avenues could have been an in-depth exploration of public discourse on tuition fees in the UK, given that Rhodes Must Fall was directly connected to Fees Must Fall. This could have entailed a 2018 scenario in which Theresa May's government would have lowered or abolished tuition fees, according to their programmatic focus (Weale, 2018). A 2023 estimate suggests that cutting tuition fees now and re-introducing maintenance grants would cost £11 billion pounds per university cohort (Johnson, 2023), which would have likely meant cuts in other areas May's government invested in, like the NHS ('NHS Funding', 2018), which would have had knock-on effects during the pandemic (NHS England, 2023). In a contrasting 2010 scenario in which the Liberal Democrats followed through on their campaign promise to abolish tuition fees (Rayner, 2019), budget

cuts in other areas of public life would have likely led to financial struggles for large portions of the population (*Child Poverty in the UK Report*, 2010). The implications of how this might have changed Britain spatially are difficult to scope, as 15 years of a more accessible, diverse higher education system cannot be feasibly conjectured. Going back to 1997 when higher education fees were introduced in the UK, an alternative financing plan is likely to have only prevailed for so long: given the subsequent era of global recession and austerity in Britain, it seems unlikely higher education would have remained free of charge in the following decade. However, it is worth noting that the tuition fees which have become so ubiquitous in the UK have been around for less than thirty years and are not pillar of contemporary society which can never be challenged or reversed. Another avenue of counterfactual exploration would be key moments of Rhodes' life which would never have made them into the public figure he represents today. One of those pivot points was the disastrous Jameson Raid in 1895 which cemented his lack of popularity in Britain (Newbury, 1981). Without this public antagonism, he might have never felt compelled to donate to Oriel in order to clear his reputation.

An intriguing and wide-reaching path is the history of De Beers, the diamond company Rhodes founded after forcing the De Beers brothers off their land in Zimbabwe (Kretschmer, 1998). Rhodes was responsible for giving diamonds the market status they have today (Newbury, 1981) – without his personal history of exploitation, engagement rings would likely not carry diamonds today.

There are other, more vague paths which see Rhodes never attending Oxford, thus not cementing a close connection with the university, or him never moving to Southern Africa, or – in a grand sweep of virtual histories – Britain never colonising Southern Africa to begin with. I could have deliberated on what might have happened if in 1167, Henry II had not banned English students from attending the University of Paris, effectively forcing them to attend Oxford instead, which led to the rapid expansion of the university. There might be no university, or one of a very different calibre, and the world as we know it would be entirely altered, from different buildings on the High Street (which might very well be a different street) to elite educational institutions around the world teaching in French. However, this form of conjecture would take us so far away from our present reality that it would defeat the purpose of this exercise.

By diving into the history of the Rhodes statue, the political issues which are presently connected to it, and our institutional connections to the reverberations of coloniality, this paper aims to illustrate how our built environments perform 'the economic, social and political ideologies of the society that creates' them (Jacob, 2012). By questioning these ideologies and those who perpetuate them, we have a chance to re-assess our own role within future histories. In this context, Western educational institutions with histories of privilege and exclusion face a particularly difficult position in facilitating critical engagement with their histories. For the University of Oxford, the 'mythology of [its] environment' (Jacob, 2012) is part of an Imperial-colonial tradition, yet as an educational institution of global influence, it aims to contribute to a plurality of knowledges which stands in contrast to this narrative. Simultaneously, it is part of a global capitalist world-system in which it must persist and balance the interests of donors with those of independent and rigorous research. In this position, it wields more power than individuals do and has the capacity of turning cultural tides.

Further, we need to acknowledge that places are not static, and neither are the narratives which we choose to carry on: in order for Oriel's New Building to exist, a row of houses was demolished. If we considered this a destruction of history, we would enter an eternal loop of never being able to change anything. This is not to imply

that we can, or should change everything because it does not align with our present ideologies. As Sathnam Sanghera states in *Empireland* (2021), 'Imperialism is not something that can be erased with a few statues torn down or a few institutions facing up to their dark pasts' (p. 14). But these actions can change how we see ourselves, and how future generations will see us.

Prototype Study

Rhodes Not Taken

Translating the virtual histories outlined above into an XR prototype could have taken various forms. To translate the proposed counterfactuals as directly as possible, three topical strands – *Political*, *Monetary*, *Spatial* – could have replicated shortened versions of each of the sections of the paper. However, this would have not used the interactive capabilities of AR in an engaging way. Relying solely on text boxes or audio snippets would barely offer more than a traditional audio guide or info booklet. Virtually removing the statue would resolve this issue, but offer little in terms of active engagement. As I will discuss in Chapter 7, *Breaking the (Virtual) Chains*, there is a risk of utilising XR applications in decolonial contexts which provide cathartic experiences without material impact. A simple virtual removal may provide experiencers with the impression of a resolution, rather engaging them in critical discourse.

As an intermediate step, I considered just adding commemorative visuals depicting the protests of 2015 and 2020, as well as the crowd present at the 1911 unveiling. However, this did not provide sufficient critical engagement, and felt too one-dimensional to represent the counterfactuals outlined above. Additionally, it would not have easily translated to other sites. Therefore, the approach I chose takes the previously outlined counterfactuals a step further in asking who, in the absence of Rhodes, could have been commemorated at the helm of Oriel. This practical application echoes the paper's chronological deep dive into virtual histories, beginning in the present and ultimately arriving in 1911 when the statue was inaugurated to a dismayed crowd. Rather than leaving the counterfactual journey at the removal, and conjectures about potential repercussions, this approach offers options of who may replace Rhodes. The removal is thus not an endpoint or informational anchor, but a starting point for critical engagement.

This approach can be applied to other sites of contestation, whether it is controversial statue, a looted artwork, or a building with a complex history. Moreover, this approach can be extended to the creation of virtual memorialisation where there is currently none. While this is not the focus of this work, it forms an important connection to other research in the field (Frayne, 2021).

UX Design

Early UX (User Experience) research about embedding approaches for contextual information during my Master's degree showed experiencers' preference for a slim baseline information approach with optional extended context (Mackenthun, 2020). The dominant visual preference in this study was to have colour-coded buttons (in comparison to drop down menus, hover options, in-image pop-up windows, and embedded links) which correspond to specific types of information. I implemented this approach in this prototype, creating colour-coded buttons for *Political*, *Monetary*, and *Spatial* contextual information. These are condensed versions of the information provided in the paper, without the academic references. A list of hyperlinked references is embedded in the main menu of the prototype.

To increase accessibility, future versions of this prototype should include a colour-blindness-friendly colour palette, and non-transparent text boxes for people with visual impairments or dyslexia. An accessibility mode could provide these factors – transparency, dyslexia-friendly font, inclusive colour palette – as individual sliders to allow for customisation. Within the scope of building this prototype, I did not have time to implement this step. In the high-fidelity wireframes and prototype, colour-coded pentagons indicate pop-up windows for contextual information in political, monetary, and spatial dimensions, as well as the main menu on the bottom left, and appearing arrows to indicate scrolling directions (see Figure 26).



Figure 26: Political, Monetary, and Spatial contextual information in prototype.

Interaction Framing

The prototype invites experiencers to scan the Rhodes statue from across the street and receive a brief summary of Rhodes' history, legacy, and the ongoing controversy surrounding the statue. Rather than asking the experiencer whether they would opt to remove or keep the statue, the on-screen prompt muses on what this space would be like if there was a different statue in Rhodes' place. For 2024, it suggests three options. Experiencers can swipe between these options, enlarge them, read contextual information in text boxes or listen to it via audio, and subsequently place this option in Rhodes' place by double tapping. Another double-tap allows a return to the carousel of options. A swipe up, however, dives deeper into time, asking what the options may have been in 2020.

An introduction provides context for the Black Lives Matter (BLM) protests in 2020, subsequently offering three options. With another scroll down, the Rhodes Must Fall (RMF) movement of 2015 is introduced, and with it a continuum to 2020 in which the BLM protests do not take place underneath the statue. The text box asks where they may have taken place instead, linking to several sites of unaddressed colonial legacy in Oxford. Another scroll down introduces 2010, where taking down the statue as part of its centennial anniversary and thus, RMF does not focus on this locality in 2015, nor does BLM in 2020.

The options for 1991, 1979, and 1964 are linked to the formal independence of South Africa, Zimbabwe, and

Zambia, respectively, from British colonial rule. The direction of prompt is less about providing several choices, and more about questioning how hindsight guides present choices. While these options all present independence activists who may have posed good options at the time, it is only in hindsight that we can assess who we would, from a present perspective, still put on a pedestal. This sequence also seeks to underline that it is an active choice to preserve a statue, and that someone qualifying for reverence at some point in time does not entitle their image to be maintained in perpetuity.

The following content suggestions emerged from a research-through-design process which combined desk research and conversations with fellow students, academics, Rhodes scholars, members of Oriel, Oxford-based activists, and people related to the South African RMF movement. While this was not a formalised process, it allowed me to explore content paths which I may not have followed on my own.

2024



Option 1: Empty plinth

Since a lot of public discourse surrounding the Rhodes statue focuses on its removal rather than what may replace it, the first image offers no replacement. It considers the visual impact of leaving Rhodes' plinth empty, and what dialogues this emptiness may conjure (Figure 27).

Figure 27: 2024 Option 1 prototype visualisation.



Figure 28: 2024 Option 2 prototype visualisation.

Option 3: Lucy Banda-Sichone (1954–1998)

Lucy Sichone was a pioneering Zambian lawyer, journalist, and human rights activist known for her fearless advocacy against governmental corruption and her commitment to social justice. She became the first Zambian woman to earn a law degree from the University of Oxford, and used this knowledge to support women in Zambia who faced stark social and legal inequalities. She was suggested as a Rhodes scholar who represented the exact opposite of Rhodes: a Black, Zambian woman who valued and prioritised those most marginalised by the oppressive systems Rhodes helped create (Figure 29).

Figure 29: 2024 Option 3 prototype visualisation.



Option 2: Alain LeRoy Locke (1885-1954)

Alain Locke was an influential African American philosopher, often nicknamed the ‘Father of the Harlem Renaissance’. As the first Black Rhodes Scholar at the University of Oxford in 1907, Locke used his studies and experiences to champion African American culture and intellectualism. His advocacy for cultural pluralism and the importance of diverse voices in literature and the arts had a profound impact on American society and continues to resonate globally. Locke presents a viable choice to replace Rhodes due to his exceptional position as the first (and for the next fifty years, only) Rhodes scholar. However, as he is often cited as support for the (false) claim that the Rhodes scholarship is, and has always been, racially inclusive⁷, this may also be a problematic replacement.

I chose to depict the 2024 options as made from a similar stone as the Rhodes statue is to convey a similar level of architectural and material legitimacy (Figure 28).

⁷ In the selection criteria for the Rhodes scholarship, it stipulates that ‘any man irrespective of race’ may be selected. Leading Rhodes experts and historians specialising on Western colonialism in Southern Africa, however, agree that this has been taken out of contemporary context. They assert that this refers to the racial divide between the English and the Dutch (Maylam, 2016), and that Rhodes likely could never have fathomed a world in which Black students would have attended Oxford. Similarly, the 55-year gap between Locke and the next Black Rhodes scholar has been repeatedly pointed out by scholars and journalists alike, some of them conjecturing that the selecting committee did not realise Locke was African-American until he arrived in Oxford.

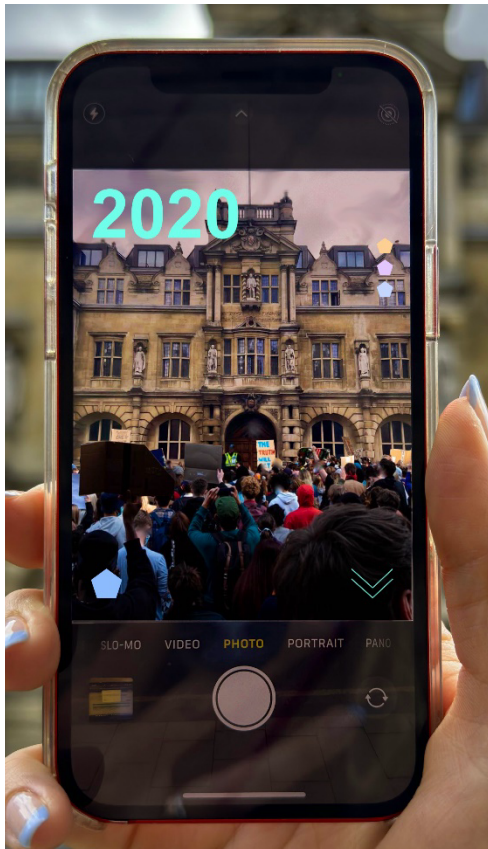


Figure 30: 2020 base prototype visualisation.

Option 1: Anthony Gormley

Following the BLM protests of 2020, which led to Oriel formally considering the removal of the Rhodes statue, British sculptor Anthony Gormley suggested that the statue could be turned around to face the wall, as ‘an acknowledgement of collective shame’ but also to ‘reassert to Oriel College and many institutions have property from Rhodes’s riches’ (Gayle, 2021). I used the AI image generator Dall-E to create an image of Rhodes turned around. It does not reflect what the actual statue looks like, but for this prototype, it was not feasible to spend extended time on an accurate visual of what the back of the Rhodes statue would likely look like.

2020

The introductory sequence for the first dive into past spatial alterations shows the BLM protests of 2020, providing context to the movement and links to further information. This doubles as a virtual commemoration of this moment in time, giving the experiencer an impression of what the protests looked and sounded like as they unfolded. This is based on video footage which pans down the street, allowing an experiencer to guide their mobile device left or right to get a 180-degree impression of the protests.



Figure 31: 2020 Option 1 prototype visualisation.

Option 2: Artworks – Hew Locke

Since the Rhodes statue is technically an artwork, one option for replacing it would be with other artworks, preferably building a contrast to White, British marble commemoration traditions. Had this been done in 2020, it is particularly likely that this would have been a Black British or African diaspora artist. An example of who may have qualified for this task is Hew Locke, whose work deconstructs colonial iconography, critiques power structures, identity politics, and representations, as well as encourages its audience to reflect on their own roles in a society based on colonial exploitation. A very topical contrast to Rhodes' legacy, Locke's *Kingdom of the Blind* (2008) is an example of what shape such an intervention might take.



Figure 32: 2020 Option 2 prototype visualisation.



Figure 33: 2020 Option 3 prototype visualisation.

Option 3: Artworks – Yinka Shonibare

Yinka Shonibare's work challenges the ways colonial histories shape cultural spaces, identities, and hierarchies. By incorporating Dutch wax fabrics—materials associated with African identity but rooted in colonial trade and exploitation—Shonibare frequently critiques how cultural symbols and spaces are hybridised and commodified through colonialism. This interplay of African and European symbols in shared spaces disrupts traditional narratives of separation, visualising the complex and layered reproductions of colonial power which persist in both global cultural spaces and in our collective imaginary.

With Shonibare and Locke, I chose two artists and artworks which would be relatively simple to incorporate in the current spatial configurations of the area the Rhodes statue would free up. In various conversations throughout this project, people suggested a wide range of

options for artistic intervention, but for the sake of keeping within the ethos of this paper and conjecturing a likely case, I selected two options which are conceptually disruptive, but not a complete reconfiguration of the currently given boundaries.



Figure 34: 2015 prototype visualisation.

2015

The introduction to 2015 provides background information about the RMF protests and their aftermath. Instead of a replacement, the carousel shows the BLM protests of 2020 not taking place in front of Oriel, but questions which location they would have centred on instead. It links to four other local sites connected to colonialism and racial violence: All Souls College, the Institute of Plant Sciences, Rhodes House, the Rhodes Plaque, and the museums of Oxford.

2010

Similar to 2015, a removal in 2010 is followed by a scenario where the RMF protests would not have taken place in front of the Rhodes statue in 2015. A key point of these two interventions is to underline the knock-on effect past spatial changes would have had on historical events as we know them. It also seeks to underline that the protests which have focused on and around Rhodes are not limited to this one oppressor, or one locality. If the statue had been taken down in 2010, students in 2015 would have still struggled with inaccessibility to higher education through fee increases. If the statue had been removed in 2015, the murder of George Floyd would have still led to mass protests, but just in different locations. These two scenarios seek to counteract virtual catharsis: while an earlier removal would have changed this space, the statue is symbolic for underlying issues, not the root of their cause.



Figure 35: 1991 prototype visualisation.

1991

Had the statue been removed following South Africa's formal independence from Britain, Nelson Mandela, one of the most prolific political activists of this struggle, would have made an obvious choice for replacing Rhodes. Mandela led the anti-apartheid movement in South Africa, a system of racial segregation and discrimination which Rhodes had helped form. After serving 27 years in prison for his activism, Mandela became South Africa's first Black president in 1994, symbolising a new political era. He won the Nobel Peace Prize for his contributions to reconciliation and justice in his home country. Out of the three examples which follow the independence of a state which Rhodes previously oppressed, Mandela is the only one who would, from a 2024 perspective, not be inherently problematic. Providing these three visualisations to underline this difficulty: hindsight casts political figures into a different light than the present, and in erecting statues, we need to collectively consider which values we are embedding in our shared environments.

1980

Canaan Banana was Zimbabwe's first president after independence in 1980, a largely ceremonial role while he worked alongside Prime Minister Robert Mugabe to help shape the newly independent nation. Despite his contributions to Zimbabwe's early leadership, his legacy is controversial due to his later conviction for sexual assault, with allegations emerging that included coercion of men in his official capacity. This conviction complicated his reputation, leading to national and international debates on leadership ethics and his contributions to Zimbabwe's postcolonial development. In contrast to Mandela's contemporary legacy, Banana is no longer revered as a national hero, thus calling into question whether, had his likeness replaced Rhodes' in 1980, he would have later been removed also.



Figure 36: 1980 prototype visualisation.



Figure 37: 1964 Option 1 prototype

Option 2: Pro-Enoch protest

For the 1964 scenario, the carousel offers an alternative which focuses on likely reactions to a removal of the Rhodes statue at this point in time. The previous three examples underline the relevance of temporal context and how changes over time – of people or attitudes – can alter societal priorities. It is relatively easy to judge people of the past in hindsight, and apply contemporary value structures to their world, when in actuality, we have no way of experiencing their world or its stakes. The nationwide protests following Enoch Powell’s 1968 ‘Rivers of Blood’ speech provide some indication of the political climate and racial tensions at the time. Powell’s anti-immigration stance which was blatantly inflammatory and racist found so much resonance in the White British population that people took to the streets to show their support and violently attack People of Colour. While this visualisation uses a picture of pro-Enoch protestors, the contextual information suggests that had Rhodes been taken down in 1964, it is more likely than not that White nationalist protests would have followed. Acknowledging the zeitgeist of a political period and the likely

1964

Option 1: Kenneth Kaunda

Kenneth Kaunda was instrumental in leading Zambia to independence in 1964 and as its first president post-independence, advocated for anti-colonial movements across Africa. He initially promoted socialist policies but became an authoritarian leader eventually, causing drastic economic decline before being forcefully removed from office in 1991. Similar to Banana, Kaunda’s position in the public imaginary has undergone drastic changes, and his depiction at the helm of Oriel would certainly be controversial today.



Figure 38: 1964 Option 2 prototype visualisation.

repercussions, rather than those one would wish for from a present-day perspective, is essential in entertaining counterfactual imaginaries.



1911

The final visualisation shows the crowd assembled for the inauguration of the Rhodes statue in 1911. It offers a reflection of the values which led to this statue being put up in the first place, and our contemporary responsibility (or lack thereof) towards maintaining these values. In a further user testing phase, I plan to follow this scenario with a gamified interaction about values and their intergenerational perpetuation.

Figure 39: 1911 prototype visualisation.

Evaluation

Hindsight

While the virtual histories analysis underlines the risks of virtual histories, the examples in this prototype study demonstrate how rarely it is appropriate to view our current status of knowledge as the end all and be all. A question therefore emerges whether we collectively promote a commemoration culture which is ‘of the moment’, in which we uplift current role models but take them down if their status changes, or a slower approach in which we wait for decades to ensure the longevity of memorialisation choices. The current mix of both – in which ‘of the moment’ memorials of the past are upheld as immovable, but there is no equivalent practice of raising monuments to role models representing contemporary values – is giving disproportionate weight to past ideologies. If there was a comparable amount of contemporary statues on buildings, in town squares and libraries, perhaps a few remnants of outdated worldviews would weigh less on the overall cultural scale. But our current spatial configurations have us inhabit material spaces dominated by imagery and idolatry of the past, whereas present or future-oriented commemoration is relegated to digital spheres. Employing XR to challenge this imbalance can be a first step towards shifting this bias. Perhaps in the future, the remnants of past belief systems can rest in a digital archive whilst our living, breathing public spaces represent a more inclusive, polyvocal zeitgeist.

Plausibility

Conceptually, removing a statue or monument is arguably easier than replacing it. One of the challenges in deciding who to commemorate in public spaces is to assess the potential for changing political alignment. While it feels relatively safe to depict a dead victim of racial violence, positive examples of roles models or political leaders hold the risk of eventually falling from grace. However, in employing virtual histories, it is essential to stay within a conceivable realm of realism. For instance, the 2020 scenario could have suggested a depiction of George Floyd to replace Rhodes, given that this is the single person most associated with the BLM protests of that year. While there is little risk in Floyd's public image changing in a few decades, it is also highly improbable Oriel College would ever make such a choice. While Floyd has become a global symbol for racialised violence, his story is rooted in the context of anti-Black violence perpetrated by the US police. There is no direct relation to Rhodes, RMF, Oxford, or even the UK, which may prompt Oriel to choose Floyd for their façade. The exercise of thinking about alternatives thus also involves engagement with the institutional reasoning behind maintaining the Rhodes statue. This may be challenging if one does not agree with that line of reasoning. This is why, for this initial iteration, I have not conducted focus groups or workshops to co-create content, but rather used this paper's analysis as the basis for visualisations. Co-creating further iterations, however, is a planned future endeavour.

Network

As part of future expansions to this prototype study, I plan to draw on connections to other contested statues and monuments in Oxford. The Rhodes Scholars for Palestine movement, for instance, has used busts at the Rhodes Building to express their protests to the Rhodes Trust's financial investments in companies which support or benefit from the war in Gaza (see Figure 40). By draping red scarves or keffiyehs over the busts, in combination with hand-written signs, they chose spatial alterations to these busts as a form of resistance. The counterfactuals in this prototype study could be embedded in a network of different forms of resistance, both material and immaterial, to compliment this form of protest. For the Rhodes statue, putting a scarf on it would be a difficult endeavour due to its position, and even contextual signs would be difficult to place. In AR, however, one could go as far as take a hammer to the statue, set it on fire, or simply allow for on-screen discussions about its presence. Such interactions could be offered as an alternative to a virtual history deep dive, as an accompaniment, or as part of a collection of different forms of spatial resistance to colonial oppression (see Figure 41).



Figure 40: The Rhodes Scholars for Palestine interventions (image credit: rhodes4pal Instagram)

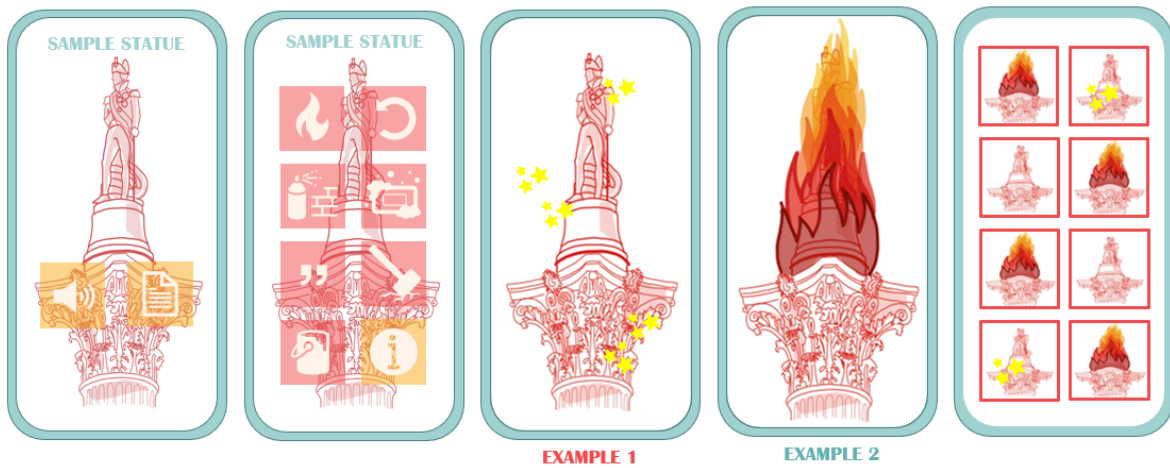


Figure 41: Early wireframe visuals of interactive options (Nelson's Column)

Interactive Options

How much freedom of choice an experiencer is given is a prevalent question in game design, and was a central consideration in creating this prototype. In the exhibition which the above analysis approach is based on, there is a clear temporal path laid out, but visitors also have the option of looping back and revisiting details. In this prototype, I strove to provide similar flexibility: the path is a historical dive which chronologically unfolds by scrolling down, offering alternative visualisations along the horizontal carousel function. Scrolling back up allows a revisiting of previous points and information (Figure 42). Crucial to the efficacy of this user interface was scrolling speed: both vertical and horizontal movements are slower than the average feedback speed experiencers would likely be used to from social media feeds and standard image databases. The main reason for this is to disable accidental skipping, or the two-axis information feeling too unwieldy. By slowing down directional information, the prototype encourages critical engagement with the contextual information. *Roads Not Taken* finished on an interactive section which revisited the very first counterfactual of the exhibition, the Berlin Wall not falling in 1989. While the entire prototype is interactive, it could be beneficial for community building and communication to encourage experiencers to share their perspectives on what should happen with the space, and potentially provide their own content suggestions. This could be combined with connecting this example to other forms of protest and critique of contested statues or heritage sites.

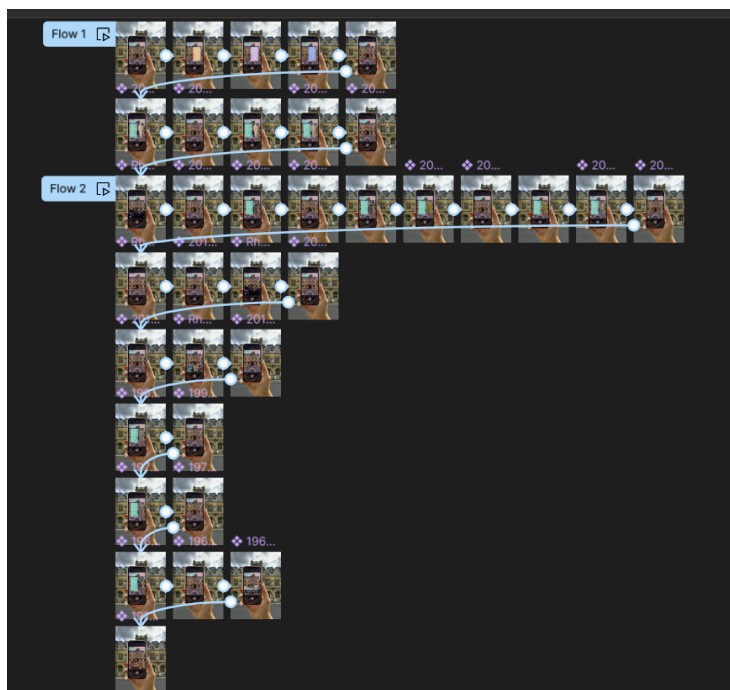


Figure 42: XR prototype path.

Reflection

This prototype study seeks to demonstrate how virtual histories may be translated into XR experiences, and illustrate the potential challenges and pitfalls inherent to this process. However, site-specific work can only extrapolate so much from its unique context (Bowser et al., 2013; Dima, 2022; Pearson, 2017). While there are connections to be made between the Oxford Rhodes statue, other statues in the UK and elsewhere, between the movements in opposition to Rhodes as a symbol of Empire and White supremacist oppression and their wider reverberations around the world, the further we move away from a specific locality and its embedded histories, the thinner the connective thread becomes. As virtual histories have gained some popularity in fiction writing and popular culture, it is all the more crucial to make this differentiation. There is nothing wrong with engaging our collective imagination, but in the context of reconstructing shared histories, differentiating between fact and conjecture has never been more vital. XR provides a potentially powerful, versatile toolset to provide people with information, but it can just as easily mislead and misinform. In this sense, there are conceptual parallels between the challenges faced by historians who employ virtual histories in their research and XR content creators who wish to engage diverse publics. This case study was a venture into demonstrating how generative this overlap can be, and to encourage other researchers and creators to step outside of medial conventions to produce engaging interactions with spatial histories.



Figure 43: In-process screenshots of different stages of scanning and 3D modelling the Rhodes statue.

Conclusion

In exploring the historical and contemporary issues surrounding the removal of the Oxford Rhodes statue, this chapter underscores the complexities of historicising and forging links between past and present. The potential removal of the statue serves as one lens to examine the intersections of colonial legacies, education, and social justice. The broader objective of this exploration is to demonstrate how built environments perpetuate social, economic, and political ideologies around histories of privilege and exclusion. Western educational institutions, with their roots in imperial-colonial systems, hold significant power in reshaping global perspectives through their engagement with diverse knowledge systems. Recognising the fluidity of both places and narratives is crucial to actively participating in critical productions of space. This includes acknowledging that actions like the removal of statues, while symbolic, can provoke critical reflection and transformation of societal identities.

While XR offers a powerful tool to support these critical productions, it also raises concerns about the risks of misrepresentation, misinformation, and the blending of fact with conjecture. In the context of social justice activism, XR has the potential to be both an empowering tool and a source of harm, depending on how histories are constructed and experienced. This prototype study suggests that a careful, self-reflective approach is necessary to navigate the complexities of virtual histories, ensuring that these tools support meaningful engagement without distorting or oversimplifying the past. The interplay between history, activism, and immersive technologies can actively shape our perceptions of past injustices and inform our present actions. By critically engaging with the histories we choose to represent, and by acknowledging the limitations and responsibilities inherent in this process, we can better navigate the challenges of creating more inclusive, socially conscious narratives.

Chapter 7: Breaking the (Virtual) Chains

CHAPTER 4

The Blue Tooth Spectrum

RQ: What are the gaps in existing XR taxonomies and how can we improve them to better position localities in space?

Conceptual taxonomy

CHAPTER 5

Facets of Space

RQ: How can spatial (meta)data for XR be organised in a structured, transferable, and transparent way?

Conceptual taxonomy, Prototype Study

CHAPTER 6

Rhodes Not Taken

RQ: How can spatial histories be re-narrated to make transparent the effects of Coloniality?

Virtual History Analysis, Prototype Study

CHAPTER 7

Breaking the (Virtual) Chains

RQ: How can XR-facilitated activism support material change?

Critical Analysis, Prototype Study



Having proposed a way of positioning localities in hybrid space, analysing those localities, sharing and cataloguing spatial data, and suggesting experimental ways of engaging with spatial colonial histories, I could begin my reflection on how XR can be operationalised to critically engage with spatial enactments of Coloniality. However, this would neglect to address the significant risks immersive technologies bear in terms of reproducing existing power dynamics and supporting performative social change. Therefore, this chapter addresses the link between XR interventions and material change. In order to do so, it repeatedly uses the term ‘virtual’ as a counter to ‘material’, which seemingly breaks with the semantic framing proposed by the Blue_Tooth Spectrum. However, the Blue_Tooth Spectrum does not suggest that the notion of ‘virtuality’ is useless, but that it should not be perceived as an opposition to ‘reality’. *Breaking the (Virtual) Chains* underlines this distinction: it frames XR interactions as ‘virtual’ forms of activism, but as part of a reality in which virtual interventions have metaphorical, emotional, and material repercussions. The first part of this chapter, the fourth integrated paper, is concerned with how to manage these repercussions in a way which supports decolonial social justice activism. It proposes Poka Laenui’s (2006) *Processes of Decolonisation* as a basis to outline actionable steps between raising awareness and facilitating material change through XR activism. The second part describes the process of prototyping *Steal It Back*, an experimental AR application to engage public audiences with restitution discourse at the Pitt Rivers Museum (PRM) in Oxford. This Chapter is aimed at activists, XR researchers, game designers, and HCI researchers who conduct social-justice focused work. It seeks to address the risks raised in the previous chapters when it comes to the potential impact (or lack thereof) of immersive experiences.

RQ4: How can XR-facilitated activism support material change?

Methods:

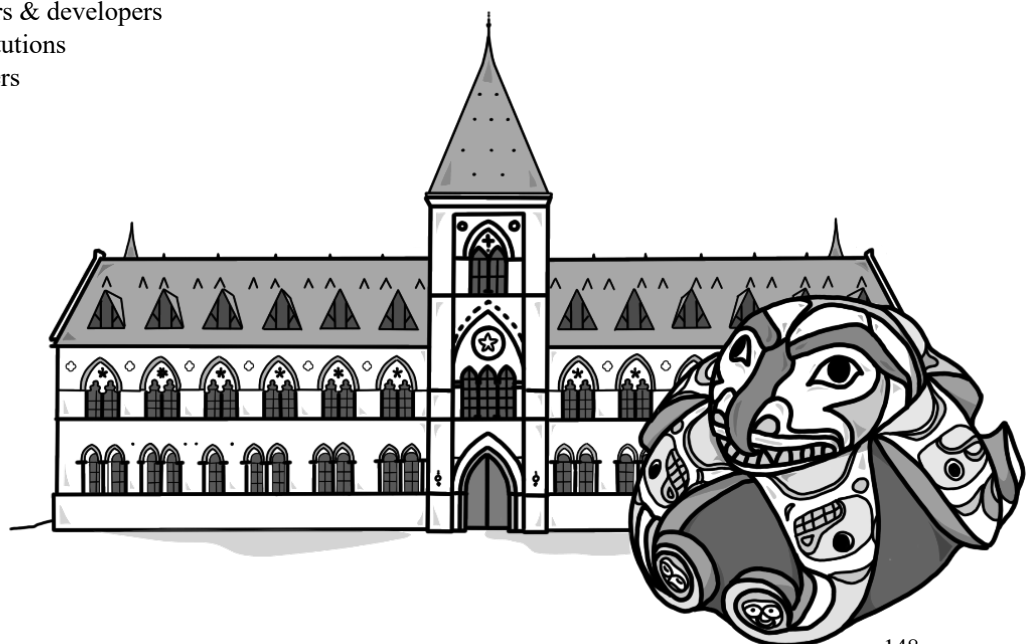
- Critical Analysis
- Research-through-design
- Prototype Study

Contributions:

- Strategic framework for aligning virtual interventions with material change
- Material-impact centric prototype

Target audience:

- Activists
- XR researchers & developers
- Heritage institutions
- Game designers



Breaking the (Virtual) Chains

XR for Decolonial Activism

Abstract

Despite the enormous potential of using immersive technologies (XR) in social justice activism, they have not been widely adopted into practice. This paper argues that by leveraging connectivity, affectivity, and embodiment as cornerstones for assessing impact and potential harms, XR activism can represent polyvocal perspectives and reach diverse audiences. To mitigate risks of using immersive technologies for activist agendas, this paper proposes that Poka Laenui's (2006) *Processes of Decolonization* offer a useful scaffolding to describe the steps between awareness and material change in activist settings. Laenui outlines (1) *Rediscovery and Recovery*, (2) *Mourning*, (3) *Dreaming*, (4) *Commitment*, and (5) *Action* in the context of colonised communities reclaiming their cultural heritage and political power. This paper argues that translating these phases into (1) *Raising Awareness*, (2) *Emotional Reckoning*, (3) *Imagining Alternatives*, (4) *Actionable Options*, and (5) *Material Change* forms an operational blueprint for the utilisation of immersive technologies in social justice activism. The core aim of this paper is to examine the possible interplay of gamification, awareness, empathy, and monetisation in XR applications to better understand this technology's potential and limitations in this space. It suggests an impact-centric framework for using XR applications in activist movements which can also be applied to other media.

Introduction

The potential of immersive technologies (XR) for social justice initiatives is evident: they promise increased audience engagement (Gunn et al., 2020; Oprean & Balakrishnan, 2020; Suero Montero et al., 2022), memory retention (G. Baxter & Hainey, 2024; Cho, 2018; Dixit & Sehrawat, 2024), empathetic responses (Estrada Villalba et al., 2021; Rouse, 2021; G. W. Young et al., 2022), and participatory content creation (Frömming et al., 2018; Gordon et al., 2011; Tham, 2018). XR can be tailored to specific interests and needs (Dima, 2014), mitigating accessibility issues like dyslexia (Miró-Mediano et al., 2023; Pong & Wah, 2019), visual and audio impairments (Moustafa et al., 2023), a variety of learning disabilities (Dutt et al., 2022; Lukava et al., 2022), autism (Bauer et al., 2023; Chen et al., 2022), language barriers (Kaplan-Rakowski et al., 2022; Lai et al., 2023; Miller et al., 2023), and attention barriers (Goharinejad et al., 2022; Pons et al., 2022). In this sense, XR is a particularly inclusive medium which allows for polyvocal content production, editing, and representation (Kenderdine, 2021). This is highly relevant for social justice movements for and by heterogenous communities and stakeholders, who intend to reach a wide range of people.

Additionally, XR curbs information transferral barriers like an inability to read (Gul et al., 2023; Montagud et al., 2020; Rüller, 2022), low engagement with long texts (Mudička & Kapica, 2023; Rzayev et al., 2021), or an unwillingness to engage with 'dry' information (Dima, 2022). Augmented Reality (AR), in particular, utilises the

popularity of smartphones to involve lay creators and encourage public engagement (Angelopoulou et al., 2012; Boboc et al., 2022; Fanini et al., 2023; Scianna et al., 2019; Shih et al., 2019; Silva et al., 2023). On top of these affordances, XR technologies are not inherently destructive to the material environments they engage with, thus providing minimal barriers to site access as well as facilitating remote engagement.

Why is it then, that XR is not already being used ubiquitously in activist campaigns?

One reason, as Lisa Nakamura (2020) convincingly argues, is the rebranding of XR⁸ as ‘technologies of feeling’ which can evoke ‘compassion, connection, and intimacy’ (p.48). This narrative is largely driven by Big Tech companies who have invested significantly into the future of the Spatial Web (Aupperlee, 2023; Jiang, 2024; Muehl, 2024; O’Hara, 2024; Rajan, 2023), a vision of the next iteration of the Internet which blends material and digital environments. Nakamura frames this as an attempt at absolution for the failure of previous technologies to meet similar hopes. The Internet was supposed to democratise information, but gave rise to rampant misinformation (Urakami et al., 2022; Zhou et al., 2023); social media was supposed to connect people, but has had an overwhelmingly negative impact on its users’ mental health (Beyari, 2023; Braghieri et al., 2022); and Artificial Intelligence (AI), whilst still in its infancy, is already showing the devastating socio-economic and environmental impacts (Beltran et al., 2024; Cazzaniga et al., 2024; Stein, 2024, p. 21; Walkowiak & MacDonald, 2023) of putting the most vulnerable members of global society at the mercy of algorithms (Eubanks, 2017). Tales of techno-optimist idealism crushing under the capitalist realities of global markets are recent and prominent enough that people do not easily jump onto the bandwagon of the next technology promising to overcome the racist, classist, and sexist structures which plague contemporary society. Thus, XR being lauded as a ‘technology of feeling’ which can increase compassion, connection, and intimacy is met with understandable scepticism.

Secondly, current implementations of XR are seldom representative of the medium’s hypothetical potential. While immersive technologies are by no means new (Lanier, 2017), their most notable popular culture successes to date include gaming applications like Niantic’s *Pokémon Go* and video-overlay filters on social media platforms like TikTok or Instagram. VR gaming, cinematic experiences, and adult film productions are on the rise, not to mention wide applications in military use, but by no means at a scale which is likely to surpass established formats in the next few years. In the cultural sector, XR applications are mostly used for artistic expression or as slightly more visual audio-guides, but there are very few applications which provide interactions that could not be achieved through other media. This lack of experimental breadth tempers wide-spread XR adoption – for now.

According to Kevin Kelly (2016), who declares the spatial future of the Web ‘inevitable’, the affordances of XR make such a strong case that it is only a question of time before a crucial threshold of mass adaptation is reached. The argument of a repetition of history which can be made against XR’s altruistic promises, as argued by Nakamura, can also be made in its favour when considering market dynamics. Companies like Niantic are currently using their products to have their users collect 3D-mapping data (Baer et al., 2022; Mehta, 2024). Through gameplay, they lead users to less datafied areas in order to collect spatial data through their devices. This echoes Google’s well-established practice of utilising their users’ geolocation data and inputs to improve Google Maps (Gentzel & Wimmer, 2024). The fact that Niantic and other big players in the immersive tech industry are replicating this approach to create maps of shared material environments is an indicator that by the time a critical

⁸ Nakamura only refers to VR, but I would argue her arguments translate to AR and MR as well.

adoption threshold is reached, virtual infrastructure will likely be ready to accommodate fast mass adaptation.

Besides concerns over the promises of XR and its current under-delivering on what this medium could do, social justice movements face an additional set of apprehensions. Part of what makes XR useful and applicable in many cases is its virtuality: it can facilitate interactions with environments remotely, or with minimal material interference. For activism⁹ which aims at material change, however, this bears significant risks. Performative interactions – interventions which *appear* to address issues whilst not actually changing anything – can actively inhibit material social justice. If an XR application, for instance, were to address a Western museum holding stolen artefacts from other cultures, this may raise awareness of this issue amongst visitors, but facilitate no material change to the situation. One of the fallacies of an approach like this, in an activist setting, is that awareness will lead to action – that museum visitors will be so outraged by the presented injustice that they exert pressure on the museum to return the stolen artworks, or vote for governments which favour active restitution policies. This is not to say that raising awareness is futile – quite the opposite: it is an essential first step on the path to action. There are, however, steps in between those two points, and XR interactions which aim to support activist causes cannot stop at Step 1.

This paper proposes that Poka Laenui's (2006) Processes of Decolonisation offer a useful scaffolding for articulating the steps between awareness and material change in activist settings. Laenui outlines (1) *Rediscovery and Recovery*, (2) *Mourning*, (3) *Dreaming*, (4) *Commitment* and (5) *Action* in the context of colonised communities reclaiming their cultural heritage and political power. This paper argues that translating these phases into (1) *Raising Awareness*, (2) *Emotional Reckoning*, (3) *Imagining Alternatives*, (4) *Actionable Options*, and (5) *Material Change* forms an operational blueprint for immersive technologies in social justice activism. The core aim of this paper is to examine the possible interplay of gamification, awareness, empathy, and monetisation in XR applications to better understand this technology's potential and limitations in this space.

Background

Bolette Blaagaard and Mette Marie Roslyng (2022) highlight three aspects of contemporary activism which factor into its intersections with digital technologies: connectivity, affectivity, and embodiedness. They follow Bennet & Segerberg's (2012) division of digital activism into *collective* and *connective action*, distinguishing between (1) movements which are driven by communities with a shared identification and cause, (2) movements in which digital networks are the key driving force, and (3) a hybrid of both. While *connective action* is prevalent in social media activism (Mirbabaie et al., 2021) and may play a role in activist uses of XR in the future, present immersive technologies are not networked enough to be considered an independent player in this field. Therefore, this paper's considerations primarily focus on XR uses for *collective* activism.

The term 'affectivity' is borrowed from Zizi Papacharissi (2015, 2016; Rohlinger & Sobieraj, 2022) and

⁹ In the context of this paper, activism describes individual or collective efforts to change systemic, institutionalised, or cultural circumstances which are perceived as unjust, oppressive, or exclusionary based on an informed, inclusive, and scientifically supportable perspective which is respectful of multiple ways of knowing and being. This means: it includes social justice movements such as *Black Lives Matter*, and environmental movements like *Fridays for Future*, but not anti-mask demonstrations (misinformation, unscientific), conversion therapy campaigns (exclusionary, unscientific), or any form of fanaticism (exclusionary). I focus on long-term activism which fosters decolonial efforts, rather than on particular political moments.

describes a sense of connectedness for networked publics who participate remotely and digitally. Affectivity, in this context, influences how publics perceive community, solidarity, and mobilisation. Blaagaard and Roslyng contrast this concept with embodiedness, which they interpret as a discursive activist body in the context of mediatisation (Reestorff, 2014). For immersive technologies, however, embodiment has different connotations, which are conceptually tied to experiences of virtual and material interactions (Cegys & Weijdom, 2020; Dourish, 2001; Maldonado-Torres, 2010).

Both Spatial Studies and Games Studies literatures offer useful framings for experiential embodiment in XR. Spatial Studies provide a relational understanding of space which allows for XR experiences to be regarded as a form of fluid, interactive architecture (Maher et al., 2000; Sheppard, 2006; Soja, 1996a). Games Studies offer a plethora of perspectives on gamification and in-game/out-of-game knowledge transferrals which translate into XR practice (Cairns et al., 2014; Hamari et al., 2016). Regardless, both framings have gaps: considering XR interactions as a form of spatial production (Lefebvre, 1974, 1992) does not sufficiently consider elements of gamification and narrative design, whereas the blending of boundaries between virtual and material experiences in XR pose a challenge in-game/out-of-game boundaries. It is precisely this in-between position which makes immersive technologies a potent medium ‘to explore the politics of place’ (Davies, 2020, p. 3). Simultaneously, it must be acknowledged that these explorations come at the risk of harmful reproduction and appropriation, and that any potential for engagement and participation is inherently tied to dangers of banalisation and generalisation. Therefore, connectivity, affectivity, and embodiment do not just offer cornerstones for assessing potential impact, but also provide markers of possible harms and omissions embedded in activist XR interactions.

For the creation of such interactions, *Radical Placemaking* is a highly relevant praxis. It combines several forms of design activism, including ‘participatory action research, slow design, and open pedagogies for marginal bodies to create place-based digital artefacts’ (Gonsalves et al., 2021, p. 1). Radical Placemaking fosters the creation of counter-narratives to support activist agendas, which may be expressed digitally or through analogue means. In this context, it is essential to distinguish between counter-narratives and a subversion of expected interaction options as a form of protest. The latter describes what Alexander Galloway (2006) refers to as *countergaming* in relation to video games, where individuals interrupt the hegemonic perception of how a game should be played in order to express protest. This form of activism utilises the ‘persuasive power of expression’ (Koenitz, 2014), which especially Serious Games provide as part of their interactional repertoire, to extend resistance to real-life issues into virtual game worlds. However, Daniel Cermak-Sassenrath (2018) argues that ‘political dissemination methods differ between life and games’, given that ‘actions and objects are often purely symbolic’ and ‘feature a rather high level of humour’ (p. 16). Calling in-game activism ‘purely symbolic’ hints at a perception of these protests as not having the same material impact as other forms of activism. While there is merit to this critique, it disregards that in many cases, virtual activism is the last resort for protestors facing persecution (Davies, 2020; Lin & Sun, 2022). Especially when challenging governments or military entities, the existing power dynamic may make virtual interventions safer and more efficient in finding their target audience than other forms of protest.

A famous example of this is artist Joseph DeLappe’s 2006 virtual boycott in the US Army recruitment game *America’s Army* (Clearwater, 2010). DeLappe entered the game to ‘manually type the name, age, service branch and date of death of American service personnel who had died up to this point in Iraq’ (*Imperial War Museum*,

2015) into the in-game messaging system. DeLappe's avatar stood in position until it was killed, then hovered near the dead body until the system 'reincarnated' him, and started the cycle all over. Both the embodiment the gameplay provided and the fact that this game was supposed to motivate people to join the army made this intervention particularly effective, challenging the notion of it being 'purely symbolic'.

Hjorth and Chan (2009) echo this challenge, arguing that in-game protests are no longer just reflections of real-world events, but that virtual game spaces constitute new arena of struggle in their own right. For XR applications which sit at the intersection of material and virtual interactions, however, it is all the more important to consider the dynamics of this interplay. Countergaming is a subversion of intended gameplay, whereas the counter-narratives which Radical Placemaking addresses can be *built into* a virtual interaction. They form a design activist practice which utilises elements of gameplay, rather than disrupting an established design. This is a shift from a user perspective *against* the design of a gamified narrative, to a creator perspective which operationalises a gamified narrative to turn a user against a game-external injustice.

This creator perspective has been explored across Games Studies, both in terms of narrative persuasion and visual language. Koenitz and Louchart (2015) argue that authorial power within narrative arcs is critical to the distribution of agency within a digital interactive narrative. They explore a range of authorial input options – from the cyberbardic creator of a dynamic *protostory* to agent-based *Emergent Narratives* (Louchart & Aylett, 2005) – to identify an informational meta-level between creator and player. The interactive flexibility a creator builds into a game narrative directly impacts player agency, and determines how directive or polyvocal an immersive experience may be. For social justice activism, this is a particularly relevant insight. Not everyone has the same radius of participation when it comes to social justice issues, which makes it essential to factor positionality into narrative structures. Namely, in this meta-level of communication between creator and experiencer, it should be transparent who is shaping the narrative. This ties to concerns around XR as a medium of empathy: the immersive capabilities of XR can easily be misused to create a false sense of authenticity. It is therefore vital for applications supporting social justice activism to retain a clear relationship between factuality and imaginary, creator and community.

In decolonial activism, sensitivity towards these dynamics is critical. Kari Kēhau Noe (2021) makes a strong argument for the centrality of community involvement in the co-creation of XR experiences which focus on Indigenous perspectives. Noe's work echoes the maxim of 'Nothing About Us Without Us' (Costanza-Chock, 2020), which has been gaining traction in both heritage curation and tech design. In the context of decolonial activism in Europe, however, this approach is a) not always implementable, depending on the historical time scale, timeframe, and target audience of the project; b) can invite tokenistic involvement of communities or individuals; and c) places educational labour on those oppressed by colonial systems. Untangling colonial threads in 'the veins of Europe' (Césaire & Pinkham, 2000) needs to be a collective effort and cannot solely be left on the shoulders of those who have, historically, been subjugated and exploited by Modern colonialism.

Regardless, claiming decolonial responsibility and taking on educational labour from a position of privilege in relation to colonial structures is a balancing act which can easily go wrong, leading to misrepresentation, appropriation, or further exclusions. There is a significant difference between a project which claims to represent the perspectives of a community – potentially without involving any members of that community – and one which engages with issues involving this community from a position of power. It is a 'write what you know' from a

perspective of critical self-reflection, not an attempt to infer someone else's perspective without consulting them. While there is potential in this approach, neither of these challenges excuse an exclusion of community perspectives where they can be included, or, as Noe (2021) suggests, be a central part of creating XR experiences. Who is being represented in an XR project, and what role members of that community play in the creation process is relevant to any project design, but in activist contexts demands particular attention.

XR could be framed as a new tool in the 'tactical repertoire' of protesters (Taylor & Van Dyke, 2007) to express their agenda. Fagerholm et al.'s (2023) case study of the Swedish division of Extinction Rebellion, a radical environmentalist movement, produces seven key tactics: (1) *visualising the invisible*, (2) *reframing reality*, (3) *decision dilemma*, (4) *guerilla communication*, (5) *using strong symbols*, (6) *challenging public space*, and (7) *connecting stories*. Using this as a sample range of practiced activist tactics, XR has potential in supporting (1) *visualising the invisible*, (2) *reframing reality*, (6) *challenging public space*, and (7) *connecting stories*. This would fall within a framing of design activism (Seliger, 2014) in which various aesthetic and creative methods are employed to support a cause. However, the participatory set-up of immersive technologies changes the dynamics of affectivity, and may result in a different relationship to community, solidarity, and mobilisation on part of experiencers and creators alike. Sabrina Zajak (2014) touches on similar interplays of forms and repertoires of activism in her framework of pathways of international influence. While it is not within the scope of this paper to reflect on how global cultural flows (Appadurai, 1990) factor into the role XR may play in international activist movements, Zajak's framework highlights important future avenues of reflection for activists using XR.

The potential of immersive technologies in collective activism promises new dynamics between affectivity and community, between embodiment and positionality. This potential could be positive, utilising a relatively novel, and inherently experimental medium to further social justice agendas, or it could be negative, exercising performative interventions which do not have material impact, or if they do, be detrimental to activist movements. Considering allocative and representative harms (Suresh & Guttag, 2021), ranging from withholding economic opportunities to stereotyping, denigration, under-representation, and ex-nomination (Lloyd & Hamilton, 2022), produces a stark contrast to the 'empathy technology' optimism promoted by Silicon Valley (Nakamura, 2020). This paper argues that to ensure XR experiences effectively support activist agendas, the relationship between virtual intervention and material change needs to be further explored. Games Studies provide some framing for this, but the spatial configuration of immersive technologies requires a different set of considerations from other forms of games. Additionally, XR applications are not always framed and perceived as games, even when they use gamification as an engagement technique. This ambiguous position, as well as its immersive modalities, create an impression of authenticity which puts XR activism at higher risk of inadvertently harming the causes they try to support. In decolonial activism, this risk is particularly high, as long-standing issues of exclusion, representation, and access accumulate on top of the risks inherent to XR. This paper suggests Poka Laenui's *Processes of Decolonisation* (2006) as a basis for an XR creation process framework which addresses these issues. The proposed framework is intended as a scaffolding for activists and XR creators to ensure their immersive experience's material impacts align with their agendas.

Proposed Framework

This framework was developed in the context of decolonial activism but can be adapted for other activist contexts. As a particularly sensitive area of activism in terms of potential harms of XR misuse, decolonial movements require a high degree of rigor when it comes to considering material impact. Other activist agendas may not require this level of scrutiny but will likely benefit from it regardless. Basing this framework in decolonial literature is a conscious move to support other areas of research learning from decolonial perspectives, which have historically trailblazed various forays towards intersectional equality and social justice.

Laenui's Processes of Decolonisation

Hawai'iian scholar Poka Laenui suggests processes of decolonisation which echo five phases of colonisation outlined by Virgilio Enriquez (1989). These phases can occur simultaneously and 'do not have clear demarcations between each other' (Laenui, 2006, p. 2). Enriquez describes the gradual eradication of a culture under colonial oppression: (1) *Denial and Withdrawal* is two-sided – colonisers deny the existence or legitimacy of an Indigenous culture whereas Indigenous people begin to withdraw from their cultural practices to protect themselves under colonial rule. (2) *Destruction/Eradication* is the physical destruction of cultural symbols and sites through the coloniser. (3) *Denigration/Belittlement/Insult* describes the delegitimisation of Indigenous religion, medicinal practice, and justice systems through coloniser institutions. (4) *Surface Accommodation/Tokenism* is a tolerance of remnants of Indigenous culture by the coloniser to demonstrate the new regime's leniency. (5) *Transformation/Exploitation* is the absorption of Indigenous culture into coloniser society, e.g. appropriation of religious holidays, music styles, traditional dress, words. Laenui engages with Enriquez' phases as a direct response, within the same cultural setting.

Laenui's (1) *Rediscovery and Recovery* describes both individual and collective excavations of a colonised peoples' history or culture. This translates to a historical and political awareness of the oppressive systems at work, which varies vastly across communities and nations. (2) *Mourning* is described as 'a time when a people are able to lament their victimisation' (Laenui, 2006, p. 3), which often takes the form of anger, depression, or other stages of grief. (3) Laenui denotes *Dreaming* as 'the most crucial' phase of decolonisation because it articulates 'a full panorama of possibilities' for post-colonial futures (Laenui, 2006, p. 4). Through debates and ideation, the present political, social, economic, and judicial structures are reevaluated to develop a decolonial imaginary. (4) *Commitment* is the collective choosing of a future direction, a shared vision for a new social order. This is arguably the most idealistic, and, according to Laenui, a potentially dangerous phase, as a lack of shared priorities can result in a skewed agenda going forward. (5) *Action* should, Laenui argues, only follow a shared consensus in the Commitment phase. This form of action only applies to situations in which contemplated, pro-active steps are possible, not to responsive action for survival.

The reason this paper does not adapt Laenui's framing on the same terms as he describes is, firstly, the context in which this framing is proposed, and, secondly, its intended audience. Laenui's phases describe a socio-political struggle for decolonisation, with Indigenous populations oppressed by colonisers as key addressees. It is a blueprint for oppressed peoples to challenge and eventually overcome the systems which oppress them. My interpretation of Laenui's phases comes from a perspective of allyship and from a position of privilege within the colonial world-system (Wallerstein, 2011), with a specific intended technological application, and with a target

audience which may span various positionalities on the colonial matrix of power (Mignolo, 2011). As a White European, I cannot speak to how Indigenous communities should frame or conduct their decolonial struggle, but I can offer my perspective on how coloniser cultures can approach their reckoning with our shared colonial past and present. I view it as a responsibility of those privileged by colonial systems to put their emotional, intellectual, and activist labour towards challenging these systems from within.

While Laenui's framing translates to other liberatory struggles, it was conceptualised in the specific decolonial context of Hawai'i. The framing proposed in this paper was created to critically address the legacies of British colonialism in Britain, from a position of privilege. By interpreting Laenui's toolset for this setting, this paper does not suggest that the efforts of privileged allies are in any way comparable to those of peoples oppressed by colonial power. It is an attempt to learn from other areas of the decolonial project, and chip away at the walls of the Master's House from both sides.

	Enriquez' phases of colonisation	Laenui's phases of decolonisation	Proposed adaptation for XR activism
1	Denial and Withdrawal	Rediscovery and Recovery	Raising Awareness
2	Destruction/Eradication	Mourning	Emotional Reckoning
3	Denigration/Belittlement/Insult	Dreaming	Imagining Alternatives
4	Surface Accommodation/Tokenism	Commitment	Actionable Options
5	Transformation/Exploitation	Action	Material Change

Table 4: Overview of Enriquez Processes of Colonisation, Laenui's Processes of Decolonisation, and my proposed adaptation for XR activism.

Adaptation for XR

This paper proposes (1) *Raising Awareness*, (2) *Emotional Reckoning*, (3) *Imagining Alternatives*, (4) *Actionable Options*, and (5) *Material Change* as a framing for XR content in activist contexts. It is essential to underline that virtual interactions cannot replace other forms of change and should be treated as a transitional aid rather than a permanent solution. Regardless, this paper argues that immersive technologies can be an effective tool for *Dreaming* and actively support *Commitment* and *Action*.

Raising Awareness

Laenui's description of *Rediscovery and Recovery* as an internal process, whether individual or collective, outlines the experience of becoming aware of an ongoing injustice, and subsequently seeing just how deep the rabbit hole goes. This is a standard part of the contemporary activist repertoire: drawing attention to an issue is a key step, and often the one most attention is spent on. Some movements focus so dedicatedly on drawing attention that the following steps of ensuring material change fall flat. An apt example of this is Just Stop Oil's soup can attacks on famous art pieces which caused controversy across the political spectrum. While climate change deniers used these interventions to depict climate activists as extremists who seek to destroy culture, other climate activist organisations shared concern over the efficacy of an attention-first approach (Whelan, 2022). There is undeniable value in drawing attention to an issue, but awareness alone does not solve the issue at hand. Historically, there is ample evidence that awareness does not translate to action (Freel & Bilali, 2022). This may be due to external

circumstances – that the fallout of action is disproportionate to the perceived importance of change, or that personal risks of persecution are too high – or due to how awareness is raised. Protests are meant to disrupt, but the level of perceived radicalness or extremism has significant impact on whether raising awareness leads to support or opposition (Feinberg et al., 2020).

In this context, XR interventions have a lot of appeal: they offer non-destructive, adaptable interactions which can be tailored to difference audiences and spaces, and their relative novelty on the mass market gives them a ‘new tech’ edge. Additionally, their lauded ability to invoke empathy could ensure that when awareness is raised, it leads to support, rather than opposition. However, having touched upon the potential risks of using immersive technologies as ‘empathy machines’ (Davies, 2020; Nakamura, 2020), an equally strong argument could be made that an empathy-centric use of XR in activism could backfire. Aside from the misrepresentation or appropriation of marginalised perspectives as potential risks, empathy-centric XR experiences could function as a form of catharsis.

Experiencers may *feel* like they interacted with an issue, and thus participated, and be discouraged from taking further steps to actualise material change. Embodiment and affectivity play major roles in this step: the more embodied an immersive experience is, the higher the likelihood of a cathartic dismissal of further action (Elmeligi & Khattab, 2024). In contrast, the more affective an experience is – the more it fosters a feeling of connectivity with other people and communities regarding this issue – the better are its prospects to facilitate action. In order to maximise affectivity and minimise the risk of cathartic detachment, this phase of XR activism should therefore focus on *information* over empathy.

Information can be conveyed in an emotive way, but there should always be a clear line between fact, opinion, and perspective. I argued in *Facets of Space* that virtual histories – counterfactual explorations of how different decisions in the past may have led to an altered present – can be an effective way to convey factual information (see *Rhodes Not Taken*). As Black & MacRaild (1997) state, by demonstrating ‘what did not happen, or what might have happened’, one may better understand ‘what *did* happen’ (p. 127). This deliberate departure from an imitation of authenticity is just one possible option for circumnavigating risks of appropriation or misrepresentation, as well as misplaced deflections of responsibility. Audre Lorde (1981) illustrates in *The Uses of Anger* that people privileged by racism – White women in Lorde’s example – tend to mistake empathy for understanding a marginalised person’s experience, and often turn this empathy into a form of self-pity, in which they believe the victimhood described to them is their own. In XR experiences aimed at empathy, the same risk exists: the immersive realism of VR may give an experiencer the false impression that they, for instance, get an authentic sense of what it ‘feels like’ to be a refugee. A counterfactual approach, in contrast, openly shows the discrepancy between reality and conjecture. It can, however, struggle with the same issues of cathartic release as empathetic approaches: an experiencer may interact and perceive that the issue is resolved through this interaction, prompting no further engagement. In choosing any information-based approach in XR activism, it is therefore vital that *Raising Awareness* is an opening, not the only move on the board.

Emotional Reckoning

Laenui’s *Mourning* expresses a colonised people’s lament of loss and oppression, which is closely intertwined

with *Rediscovery and Recovery*. Contrastingly, *Emotional Reckoning* is a phase which accommodates the emotional whiplash of *Raising Awareness*. Depending on one's positionality, this could involve *Mourning*, but also other forms of coming to terms the presented information. Shifts in perspective are often accompanied by resistance and grief (Acheson, 2022; Stanley et al., 2021). This is particularly visible in environmental activism: denial manifests as people denying climate change and ignoring scientific proof (Dryzek et al., 2011; Wullenkord, 2022); anger is frequently expressed against the protestors who draw attention to climate change (Park et al., 2021; White, 2021); bargaining involves a pushing away of personal responsibility (Kleres & Wettergren, 2017); depression takes the form of collective inaction in the face of seemingly insurmountable global issues (Latkin et al., 2022); and acceptance is often more an acknowledgement of one's own helplessness, rather than a jump to action (Said & Wölfl, 2023).

In the context to decolonial activism, the weight of these phases varies depending on one's positionality. For an Indigenous community as described by Laenui, *Emotional Reckoning* and *Mourning* may be the same, with anger against the coloniser and depression over the loss of a collective identity playing central roles. From the perspective of someone privileged by the colonial world-system, denial is a prevalent factor: the impact of colonialism on present culture is frequently denied, downplayed, and belittled (Churchill, 2012; Elias, 2024; Reibold, 2023; Sullivan, 2021), echoing Enriquez' third phase of colonisation (*Denigration/Belittlement/Insult*). This is an important aspect of coloniality to underline: colonial belief structures are iterative, and constantly re-establish themselves – that is part of why they are difficult to challenge (Feagin, 2020). The continuous re-colonisation of thought and value systems has been discussed extensively by decolonial scholars (Dussel, 1993; Grosfoguel, 2002; Lugones, 2010; Maldonado-Torres, 2010; Mignolo, 2002, 2011; Ngugi wa Thiong'o, 2011; Oyěwùmí, 2005; Quijano & Ennis, 2000; Tlostanova, 2019), illustrating why common reactions to acts of decolonising are forms of re-colonising, in Enriquez' terms.

If someone privileged by colonial value systems moves past denial, their anger is often pointed at those who are raising the issue, at faceless institutions, and people of the distant past. It is rare for privileged people to direct their anger at tangible ancestors, let alone themselves (Applebaum, 2017; Feagin, 2020). This is a point XR interactions can actively counteract: they can narratively streamline generic, shared histories into collective and personal responsibility. For people marginalised by colonial systems, this can be a process of emancipation and renewed identity building, as Laenui outlines, whereas for people privileged by colonial structures, this stage needs to involve critical self-reflection. Bargaining, depression, and acceptance are likely to overlap in this process, and close attention must be paid to the transition to the next phase, *Imagining Alternatives*. Otherwise, there is a risk that privileged people accept the realities of coloniality without an inclination to act.

Similar to the argument against empathy-centric XR interventions in *Raising Awareness*, the *Emotional Reckoning* phase is only of limited value to activist movements if awareness and acceptance do not lead to action. Based on activist strategies in other media, the key to further involvement is to clearly convey to experiencers how they can support (Freel & Bilali, 2022). In the case of ads on TV or social media, this often takes the form of donations – in a common example, a clip showing children in a refugee camp is intended to evoke empathy, a call for donations is a path to action. While one can criticise such strategies as symptom-treating rather than action to uproot the cause of the issue, they certainly offer more towards material change than the 'experience travelling' Nakamura (2020) describes. Simultaneously, it is important that between *Raising Awareness* and action,

Emotional Reckoning is given its due space, as not to rush the process of understanding the stakes at play. Otherwise, action risks merely being an indulgence to appease perceived guilt, rather than a move towards long-term change.

Imagining Alternatives

Laenui (2006) describes *Dreaming* as a ‘full panorama of possibilities’ which encourages ‘debate, consultation, and building dreams on further dreams which eventually becomes the flooring for the creation of a new social order’ (p. 4). It is a phase of articulation of how things should be, rather than how they are. This can, however, not be done without an awareness of the next steps on the horizon, *Commitment* and *Action*. Therefore, *Dreaming* should not be an entertaining of unattainable utopias, but a serious engagement with possible decolonial futures, if the aim is material change. XR is a medium that can support this aim, but as aforementioned, not all XR engagement is conducive to activist movements. Without critical contextualisation, immersive experiences run the risk of appropriating, trivialising, or misrepresenting perspectives. While this is a relatively well-established issue in Games Studies, XR designers and content creators do not necessarily position their work in this context. Immersive technologies can be placed within social media discourse (e.g. AR functions of Instagram or TikTok), HCI (e.g. UX design, optics, sensors) and Games Studies, amongst other fields, but they can just easily evade any limitations or cautionary tales set by these contexts. To avoid negative impacts of XR interactions on activist efforts, however, adopting as many cautionary tales from related fields as possible is a sensible starting point. The more sensitive an issue, the more central this consideration should be.

Considering the limitations of XR in relation to activist causes is a key component of *Imagining Alternatives*. As a person privileged by colonial structures, engaging in the type of *Dreaming* Laenui describes would be a form of re-colonising the emancipatory imaginary of marginalised communities. Rather, XR interventions involving privileged publics could address current forms of colonial value perpetuation, and how those could be inverted or changed. In the case of a stolen Indigenous artwork held by a European museum, for instance, this would not entail imagining what the return of this artwork would mean to the origin community, or how this community might integrate the artwork into their cultural practice going forward, but what steps the museum to facilitate restitution. How could this artwork be returned, to whom, by whom, on whose terms? Who are the people with decision power, whose interests do they represent, and whose laws govern the terms of any exchange? While these questions are logistical, they belong to the imaginary of change. Asking them is building a ‘flooring’, as Laenui puts it, for the creation of future paths which differ from the current trajectory.

Part of this step is recognising that keeping colonial systems in place is not a passive happenstance, but an undertaking which demands time and effort. In the case of a contested statue, to provide another example, these questions could involve how this statue is presently maintained, by whom, and with what funding. This moves away from a narrative of “violent mobs try to destroy cultural heritage” to “a lot of our tax money is going into the polishing of slave owner statues” (Decker, 2024). The latter may not be the argument an activist group aims for – the removal of a statue has symbolic value, and removing it for the wrong reasons could be detrimental to long-term recognition and change. The nature of the intended message is less relevant, however, than the fact that XR is a medium which can facilitate this kind of discussion in varied ways. Immersive technologies allow for a multiplicity of perspectives to be included in the same interaction, with experiencers being able to switch between

them, and potentially contribute their own. This, too, is part of expanding the imaginary: by placing the experiencer in the middle of a discussion which they feel they are invited to participate in, subsequent action becomes more tangible.

Actionable Options

If a sense of collective responsibility has been established, and there is a vision of possible change, the next phase to consider is *Actionable Options*. This departs from Laenui's notion of *Commitment* because it is not reliant on a shared sense of directionality. In the absence of a shared community amongst experiencers, or a shared positionality in relation to colonial oppression, such a shared direction is hardly attainable. Rather, *Actionable Options* is a phase which bridges *Imagining Alternatives* and *Material Change*. Alice Procter (2020) implemented this analogously in her critical tours of the National Gallery in London, where she invited tour attendees to single out artworks they thought should be removed from display and note them on a 'feedback slip'. The slips were formatted as addressed to the National Gallery, implying that this posed a form of intervention which may be visible to the institution.

In XR, such options could be implemented, updated, and amended as needed with relative ease and at low cost. A critical engagement with a controversial statue, for instance, could be followed by a form to fill in to send to the local council. A virtual representation of a protest encampment could link to a website where people can articulate their support or encouragement¹⁰. They could link to petitions, donation pages, supporting organisations, teaching resources, reading lists, etc., depending on the activist aim.

If the momentum of an activist XR intervention is to be maintained, it is crucial that after an experiencer is informed, works through their emotional response to this information, gains a sense of responsibility towards the issue, and engages in possible alternative futures, they are given the tools to participate. This is not to place all responsibility on individuals, or give them a false sense of being able to single-handedly resolve deep-rooted issues. Rather, this step aims to counteract the depression phase of grief: to show that there are options of implementing positive change, and to create a sense of *connective* community with strangers who share one's sense of responsibility. These steps of potential intervention need to link to implementable actions, otherwise there is a continued risk of performative involvement, which leaves the experiencer with the cathartic sense of having participated, and having taken steps towards change, whilst not actually having material impact.

Material Change

Laenui's (2006) description of Action encapsulates a wide range of options, from 'calls to reason' to a 'resort to arms' (p. 6). He underlines the importance of this phase following a full fruition of prior phases, and that any action should be a pro-active based on community consensus, rather than a reactive step in the context of *Mourning*. Translating this aim to activist XR, a key question is: 'Who does this impact, and how?'

The reality of many activist movements is that they need money in order to advertise, campaign, pay legal

¹⁰ This could also invite unconstructive criticism and abuse, but these risks can be effectively mitigated by strict editing protocols at the backend of XR-facilitated participatory elements.

fees, and keep the people who are dedicating their time to the cause afloat. Monetary donations are one of the most established routes of action, and often the most efficient one (Afridi et al., 2023; Martin et al., 2007). However, especially in the context of decolonial activism, which is fundamentally anti-capitalist, throwing money at a problem is not necessarily a sustainable solution. If integrated badly, the notion of donations can lead to people rejecting the very premises an activist intervention is trying to convey.

Numerous organisations in climate change activism offer carbon calculators to let people estimate their own carbon footprint, only to follow this assessment by a suggested donation which would offset that footprint. Very similar to medieval indulgences practice, this call to action repositions the previously conveyed information. It suggests that a person could ‘make up for’ their carbon footprint by donating, when in actuality, this donation will not undo the emissions caused by that individual (S. Dalsgaard, 2022). In contrast, organisations which follow their carbon footprint calculations with instructions of how to reduce one’s carbon footprint through lifestyle changes, convey an acknowledgement that while the clock cannot be unwound, going forward, people can choose a more sustainable path. In decolonial contexts, the same applies: monetary donations should not be a form of guilt-appeasing, but be oriented around the long-term goals of the activist movement and those who are impacted most by colonial violence.

In practice, this means a clear declaration of where donations are going to, and who governs their use. In the case of an Indigenous community seeking to repatriate a stolen artwork, this might work as donations to legal fees or to support activists spending their time on negotiating the terms of return. In the example of a statue’s removal from public space, however, a donation scheme like this may be entirely impractical, and the ways in which donated money could be applied much too opaque. Without a community which can independently govern the direction of action, as Laenui outlines, monetary donations lose appeal as a form of material impact. To achieve the removal of a contested statue, symbolic forms of resistance or policy-level interventions could be far more effective. For XR interactions in this space, it is therefore essential to have a clear focus on who is impacted by the chosen form of action, and how. Similar to Laenui’s argument that *Commitment* and *Action* should not be rushed to the detriment of *Dreaming*, monetisation approaches should not be implemented in XR activism without first considering the long-term aims, and the change that these donations are supposed to support. Taking seriously the risks for the most vulnerable portions of the affected public means a shift from defining impact as ‘positive change for the largest amount of people’ to ‘positive change for those most affected by this issue’. It is a commitment to carrying decolonial responsibility into a realm of implementation which prioritises perspectives which have historically been marginalised, excluded, and silenced.

Limitations

There are three types of limitations to consider in relation to the proposed framework. Firstly, limitations in being able to extrapolate from a decolonial framework intended for Indigenous audiences to one that leverages positions of privilege. In every adaption of a framework to another context, nuances are lost, and details are interpreted in a way which may not align with the original framework’s intentions. As stated above, the proposed adaptation in this paper does not seek to equate the efforts of privileged allies with decolonial activism from communities oppressed by colonial structures. This comes with strong limitations on content and perspectival

engagement, which, based on the mentioned concerns regarding ‘experience travelling’ in XR, should be embraced. Acknowledging and respecting these limitations is a decolonial move in itself, reverting the expansionist ethos of Eurocentric worldviews.

Secondly, this framework is limited by the technology it is intended for. XR has a lot of potential, but also bears significant risks – from a false sense of authenticity to worst-case-uses like MR glasses being used to ‘edit’ material environments for the wearer (Mahdawi, 2024). It is, ultimately, a virtual form of intervention, and as outlined above, can easily be misused to do more damage than good. The framework proposed in this paper is an attempt to counter this risk, but it is not a fool-proof way of mitigating it.

Thirdly, the freedom of interpretation which both Enriquez and Laenui’s *Processes* leave to their readers translates into this adaptation. The proposed framework is not a step-by-step guide on how to build an impactful XR application for activism, but a conceptual and ethical scaffolding to encourage XR creators to ask critical questions and make conscientious choices.

Conclusion

Before immersive technologies will be widely adapted into the activist repertoire, there are several hurdles to overcome. The ongoing tension between tech-optimist Silicon Valley voices who laude XR as the ‘empathy technology’ of redemption and the significant risks immersive interactions pose in activist spaces will not be resolved by one framework or one application. This is an asset, however: both activist and XR creation spaces, share fundamentally polyvocal, experimental, decentralised structures which push innovation and progress simultaneously in varied locations, fields, and critical contexts. The framework proposed in this paper is intended as one such step: it adapts a decolonial activism approach – Laenui’s *Processes of Decolonisation* – to mitigate existing risks in using XR for social justice activism. By leveraging connectivity, affectivity, and embodiment as cornerstones for assessing impact and potential harms, XR applications can become powerful tools to represent polyvocal perspectives and reach diverse audiences. In order to realise this potential, however, it is impertinent that activist XR does not merely focus on raising awareness or evoking empathy. Only after an experiencer has been informed sufficiently about an issue, has had the opportunity to emotionally process the information, and has been given tools to envision a different path forward, can they start taking steps towards change. To facilitate this flow, ideations on possible alternatives should be accompanied by concrete action points which motivate experiencers to implement change. That change, whilst encouraged and facilitated through an XR application, will necessarily have to happen in the material world.

The steps outlined in this paper were created with decolonial activism in mind – other activist movements may not need to allot as much time to their experiencers coming to terms with the conveyed information, for instance. Regardless, there are some steps which are transferable across all types of activism. One is that raising awareness is a necessary initial step, but it should never be treated as a final goal. In order to harness XR for material change, engagement cannot stop at awareness or empathy. Another transferrable point is that evoking empathy through XR interactions should be treated with caution, and the authenticity of the presented experiences should be critically contextualised, irrespective of their content. Similarly, building monetary donation models into XR applications can be an effective approach, but activists need to ensure that this is done in a way which does not

undermine the core message of their agenda.

Aside from transferable words of caution, there are also promises of potential which are applicable outside of the context of decolonial activism. As other forms of gaming-based protest have demonstrated, there is activist potential in appropriating immersive technologies to subversive narratives. An added bonus of XR's increased immersive functions is that it can motivate people to act out things they would not normally be allowed to. Shooting paint balls at a statue may be illegal offline, but in an Augmented Reality application, this could be an outlet for emotional reckoning. Virtually stealing, restoring, or vandalising contested artworks offer a plethora of protest interactions which do not harm the actual artwork. However, this virtuality also has the disadvantage that no one has to clean up a virtual can of soup: if no action follows this in-game subversion, it may lead to no material change. As several in-game protests in the realm of video games demonstrate, this also does not have to be the end of the story. In a hybrid world where digital and material spaces constantly interact with one another, lines of where protest can have impact constantly shift, and there is no established map of what does and does not work. This framework aims to contribute a few points of orientation on which activists and XR creators alike may build their future roads, alleys, and highways to lasting change.

Prototype Study

Steal It Back

This section describes a prototype called *Steal It Back* which I developed to engage museum visitors in restitution discourse. While *Steal It Back* is the complimentary prototype to *Breaking the (Virtual) Chains*' considerations, it is not a direct result of its suggested phases. As is often the case with research-through-design, the process goes back and forth between conceptual considerations and design experimentation. In this case, I started the Version I wireframe whilst building out the framing of the paper. Similarly, working out the conceptual core of the paper's contribution happened parallel to building the Version II prototype. In building Version II, I recognised some of its shortcomings in terms of accessibility¹¹ (e.g. the colour scheme in relation to colour vision impairments) and the interactive modalities (e.g. which actions are key to the narrative). It was through building Version II that my attention was drawn to the risk of cathartic functions in this prototype, and therefore included these concerns in my conceptual considerations. Due to this development process, *Steal It Back* may feel more separate from *Breaking the (Virtual) Chains* than the prototype studies accompanying previous papers, when, in actuality, it has been a core component of shaping my considerations around activism, virtual interventions, and material impact.

Site Selection

As described in the Methodology chapter, I selected sites for the case studies and prototype studies in relation to one another, based on the following criteria: dimension of spatial coloniality, discursive relevance, transferability, mapping onto paper propositions, public accessibility, contextual data density, repetition, and proximity to other sites. In engaging with spatial enactments of Coloniality, restitution discourse is one of the main arenas of ideological debate (Tythacott & Arvanitis, 2014). Questions about whether stolen, extorted, or looted artefacts should be returned to origin communities are similarly divisive as the removal or maintenance of colonial statues (Bacci, 2024; Colwell, 2015; Curtis, 2006; Vawda, 2019). Therefore, creating a prototype which engages with this discourse provides a complimentary perspective to the previous prototype studies, which engaged with a building and a statue, respectively.

Of the major Oxford museums, the Pitt Rivers Museum (PRM) has significant relevance in national decolonial discourse (Hicks, 2020; Procter, 2020). A traditional Western collector's museum, the PRM represents a struggle many similar institutions face in dealing with their histories of violence. The PRM has been more active in critical self-reflection and involvement of origin communities than most major UK institutions. The Museum's collaboration with curators, artists, and community members from Haida Gwaii is of particular interest in this context because the Haida curators involved in one of these collaborations wrote a book, *This Is Our Life* (Krmopotich et al., 2014) on their experience. Additionally, the Cabinet project, an Oxford-based project to provide a virtual platform for teaching and learning with museum objects, developed an AR feature (with the PRM/in collaboration with curators at the PRM) which included several Haida artworks. This context influenced my

¹¹ This paper works with Persson et al.'s (2015) notion of design for accessibility which aims 'to provide as effective and usable opportunities as possible for all potential system users, regardless of the challenges, the users may face' (p. 524)

choice of site for this prototype study, a Haida artwork labelled ‘the Octopus Helmet’ in the museum.

In a 2009 collaboration called *Haida Material Culture in British Museums: Generating New Forms of Knowledge, Haida* (PRM Collections Online, 2024) delegates describes this helmet as a ‘war helmet’ which would have been worn by a war chief or their captains to protect them from arrows and blunt trauma, however, they also acknowledged that some war helmets were used for war dances, rather than actual battle. Haida war helmets evolved into crests and the wood they are made of – and thus their weight – is indicative of whether they were for practical or ceremonious use. The Octopus Helmet is presumably carved from alder wood, and painted in a traditional Haida style. Since the shape is not a realistic depiction of an octopus, the delegates involved in the project discussed the possibilities of this being an octopus mid-transformation into a mammal, a starfish, or an abstract representation which is not a specific animal. The helmet was studied by visiting Haida master carvers in 2014 (Krpmotich et al., 2014) as part of another collaboration, which included the replication of a wooden Haida chest, which the master carvers then took to Haida Gwaii with them. The original, however, remained at the PRM. This is a circumstance Krmpotich et al. reflect on, and which motivated me to choose an artwork from this collection for the prototype study for *Steal It Back*. It is worth noting that that the helmet was most likely acquired, from an unknown source, by Augustus Pitt Rivers in the 1870s. While the exact circumstances are unknown, it is relevant to point out that Haida Gwaii has a comparatively well-documented historical account of its artworks being removed from origin communities, whether through legitimate purchases, extortion, or theft.

My rationale behind choosing a much smaller-scale locality was to create a productive contrast between the three sites which would allow me to explore different forms of possible XR engagement. However, as acknowledged in the Methodology chapter in reference to Cegys and Weijdom (2020), for an AR prototype, the helmet’s present context as being placed in a cabinet in the PRM, cannot be ignored from an interactional perspective.

Below are the selection rationales, according to my site selection criteria:

- *Dimension of spatial coloniality*: Restitution and displaced artefact discourse
- *Discursive relevance*: Pitt Rivers is prominent in national discourse, Haida artefacts are held in museums all over Europe
- *Transferability*: Echoes the position of other displaced artefacts in Western museums
- *Mapping onto paper propositions*: Suitable for *Breaking the (Virtual) Chains*
- *Accessibility*: Publicly accessible for free, but only during opening hours; indoors.
- *Contextual data density*: This Is Our Life book, documentation on Pitt Rivers website about collaborations and decolonial work, The British Museums
- *Repetition*: I chose the Pitt Rivers over other Oxford museums because it has fostered more critical engagement with its colonial history
- *Proximity*: The Pitt Rivers Museum was my original prototype study for *Breaking the (Virtual) Chains* and thus the end of an imagined path between the sites

Wireframes and Prototyping

Version I

The first iteration of *Steal It Back* was based on my analysis of Vice Media's *Unfiltered History Tour*'s shortcomings in terms of navigating impact (Rivera-Carlisle, 2023). The *Unfiltered History Tour* was a supposedly subversive Instagram-filter based AR web application developed by Dentsu Webchutney, to be used at the British Museum (Dentsu Webchutney, 2022). My lo-fi wireframe of Version I began with an interactive map to guide experiencers to the artwork because a point of criticism regarding the Tour had been that their location map was confusing and untransparent to both repeat and first-time visitors to the British Museum. As my development of Version I predates the decision to focus on Oxford-based sites, one of the artworks featured in the Version I wireframe is Hoa Hakananai'a, an moai who was removed from Orongo, Rapa Nui, in 1868, and brought to England, and now exhibited at the British Museum. The ethics of scanning this entity was not at the forefront of my inquiry, as Hoa Hakananai'a had already been scanned by the Tour, and photographed by thousands of tourists. However, this question being unresolved was one of the reasons which made me look for alternative artworks and sites.

Following the interactive map leading experiencers to Hoa Hakananai'a, Version I was designed to scan the moai and offer contextual information as either on-screen text or audio. Following this information, experiencers would be prompted to scroll up to keep Hoa Hakananai'a on the plinth at the British Museum, or scroll down to virtually 'steal back' the artwork. A swipe right function offered further information for experiencers who felt not informed enough to make this decision. Scrolling up would result in an interactive option to polish the artwork, whereas a scroll down would be followed by an empty plinth, prompting the experiencer to manually input what artworks they would rather see on the plinth.

A second artwork featured in Version I were the Benin Bronzes (*not depicted in Figure 44*) held at the British Museum, also included on the *Tour* web app. Version I's 'post-stealing' screen declared that an organisation had donated £1 to a restitution initiative as a result of the experiencer choosing to 'steal back'. This was my first attempt to implement the interaction-to-material-impact line which is central to this chapter. However, mapping out early designs, several concerns arose.

Firstly, linking a donation to an experiencer's action opened questions about potential blue washing. Could just any company donate to the scheme, in order to be featured as having supported a restitution initiative, or should there be a vetting system? If so, how would this work for private donations? I researched how this is handled on Patreon and other donation-based apps (Karpetz, 2015; Sanyoura & Anderson, 2022), but if the main objective is to counteract performative donations, this is mostly a corporate, rather than a private concern. In practice, however, this could be decided by the restitution initiative who would be receiving the donation. Strategies for facilitating these types of donation models present a valuable area of future user research.

Secondly, the prominence of individual artworks factors into how people perceive them, and based on donation behaviour studies in other fields (Hladká & Hyánek, 2015; Vesterlund, 2006), this is likely to impact their willingness to engage. Dan Hicks (2020) and Alice Procter (2020) both recently discussed the Benin Bronzes in hugely successful books, which impacts the likelihood of experiencers already having knowledge of or opinions on these particular artworks. This consideration impacted my decision to opt for a Version II site which is lesser

known, but equally rich in complex history.

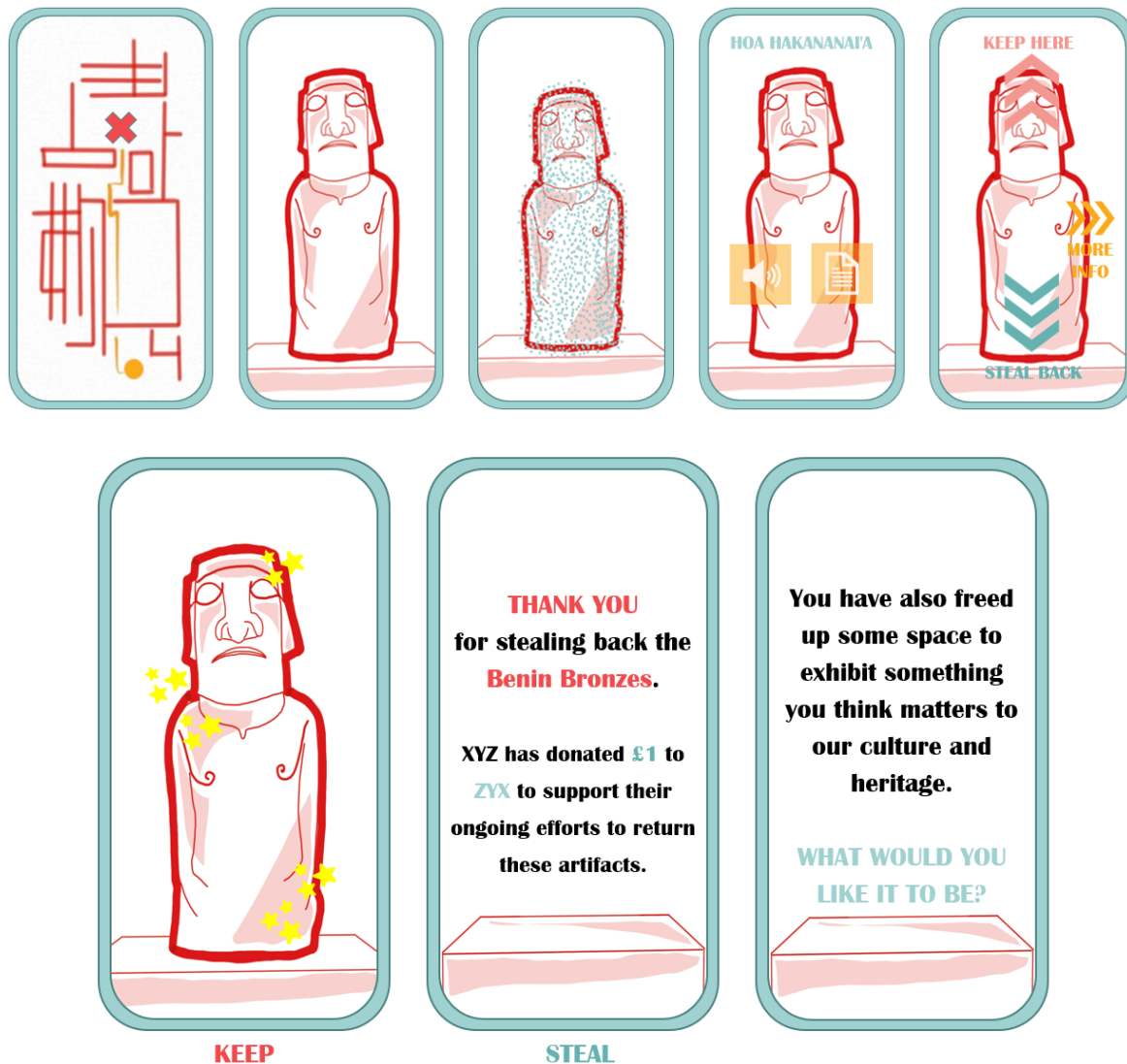


Figure 44: Version I wireframe of *Steal It Back*

Version II

I developed the second version of *Steal It Back* as part of a prompt for accessible gaming, with the aim of increasing the accessibility of a chosen space through a mobile game. Museums as traditionally exclusive spaces – first for extremely privileged collectors, then educated members of the public – played a central role in designing some of its elements (Dawson, 2014; Kinsley, 2016). Rather than beginning with a map, this version has experiencers select an artwork they want to know more about. For this prototype path, I used the Haida helmet, which I had by then selected as part of this thesis.

In Version II, experiencers are provided with some contextual information about the helmet and then asked: ‘Are you allowed to run in museums?’. The intention is to challenge what people perceive as acceptable or normative within museums, and therefore, who museums are for. Upon reading several studies on publics who feel excluded from museum spaces (Abungu, 2019; R. McC. Adams, 1992; Allen & Hamby, 2011; Eccarius-

Kelly, 2020), the first task was to challenge how people perceive museum spaces.

Three possible choices are provided as answers to the running question: ‘Yes’, ‘No’, and ‘Only if no one catches me’. The point of this question is to make experiencers feel like they can shape the museum experience to their preferences, and to challenge whether there is a specific way to behave in a museum. At the same time, it would be rather reckless to encourage people to sprint through an exhibit. Therefore, this question is supposed to sort experiencers into three groups: ‘Daredevils’ (‘Yes’), ‘[Goodie] Two-Shoes’ (‘No’), and ‘Sneaky Lemons’ (‘Only if no one catches me’). ‘Daredevils’, who believe running is permitted, are likely less concerned with museum etiquette and are therefore given a task which encourages them to move through the space in a slow, careful way. They are instructed to find the artwork they selected in as few steps as possible, prompting them to use large, but not necessarily fast steps. When they reach the artwork, experiencers self-report how many steps it took them to get there, and this number determines the amount of extra time they receive for the next task. For ‘Two-Shoes’, who are presumably concerned with the rules of the museum, the task is to break the rules a little by getting to the artwork as fast as possible. Upon arrival, they self-report their time, which determines their allocated extra time for the next task. For ‘Sneaky Lemons’, the first task is to reach the artwork with as few people as possible seeing them. This number, too, determines how much time they are allocated for the subsequent task.

Having a ticking clock is mostly to introduce urgency into the interaction, and not make it seem like it does not matter if the experiencer chooses or not. The introductory ‘running’ task doubles as an introduction to the principle that choices have in-game repercussions. The subsequent task is timed based on the first task, and begins with more contextual information about the helmet. Then, experiencers are prompted to decide what to do with the helmet now, of five options: ‘The helmet should be given back’, ‘The helmet should stay here’, ‘The helmet needs context’, ‘I need more information’, and ‘I have another idea’ (see Figure 45), which each open up a different interactive path (see Figure 46).



Figure 45: Interfaces of the Steal It Back prototype

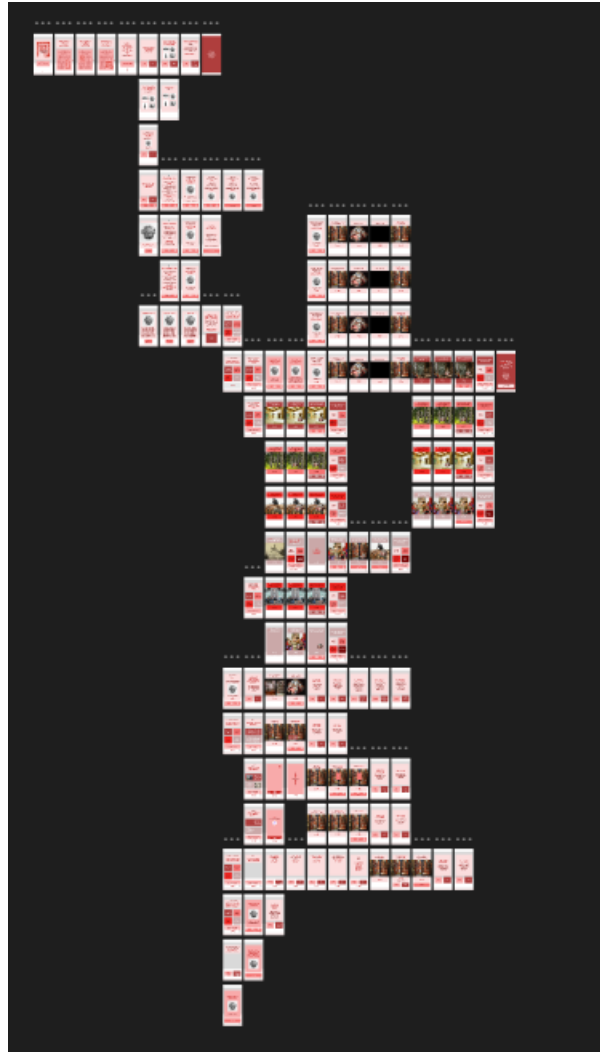


Figure 46: Decision tree path of Steal It Back prototype.

In each path, there are contingencies for experiencers providing their own answers, which are registered and internally reviewed for future interactions while the experiencer is looped back to the other choices, or to finish the experience. The other choices provide separate path trees. If, for instance, an experiencer choose to ‘give back’ the helmet, they are subsequently asked where the helmet should be given back to: ‘The country it was taken from’, ‘The region it was taken from’, ‘The community it was taken from’, or ‘Other’ – the latter being the ‘write your own answer’ option. Each contingency is followed by a further question, increasingly complicating the issue. Choosing ‘community’, for example, then asks where the helmet should go within the community it was taken from. The options – ‘A museum’, ‘A heritage site’, ‘To the descendants of the maker’, ‘To the descendants of the owner’, ‘I have another idea’ – each lead to some form of challenge which the experiencer needs to resolve. ‘To the descendants of the owner’, for instance, follows with ‘There are no descendants left. What do we do now?’, which then offers five options again.

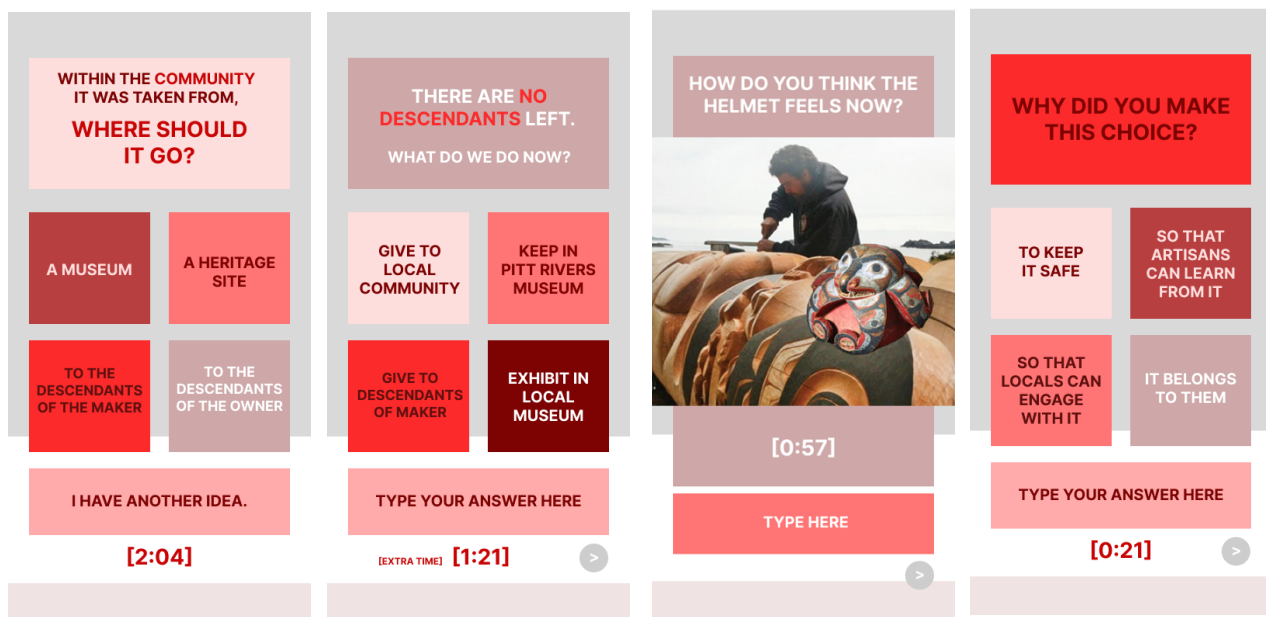


Figure 47: Some of the 'stealing' pathway choices in the Steal It Back prototype.

Ultimately, experiencers in the 'Stealing' pathway are directed to scan the helmet in the display case before them, which produces a 3D replica on their screens. They are then instructed to tap the helmet to 'steal it back', and subsequently turn around, at which point their chosen destination background appears on their screen. In the final version, this will be a 360 environment overlay which allows experiencers to place the helmet where they wish. The physical turning around is essential from an interactive perspective – the experiencer needs to have an embodied sense of taking the artwork out of the case and putting it somewhere else. Once they have placed the item, they are prompted in two subsequent ways: firstly, they are asked to consider how the helmet feels now, and secondly, why they made this choice.

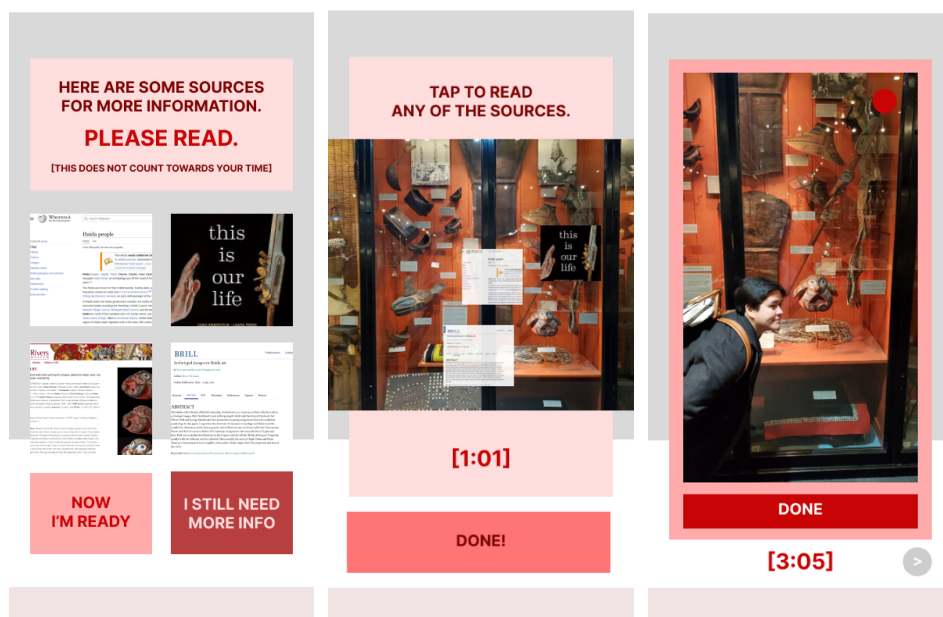


Figure 48: Some of the content contribution options in the Steal It Back prototype.

The non-‘stealing’ paths lead to a similar interaction: keeping the helmet in the museum involves an AR interaction in which experiencers ‘dust off’ the helmet to make it presentable in its case and then reflect on why they made this choice. The ‘information’ path interactive experience is different, as it provides experiencers with contextual materials – documents, audio clips, videos – which they can virtually place to annotate the helmet. Every path eventually asks experiencers to reflect on why they made their choice, which opens a direct narrative path to ask whether they think this choice should be theirs. I also conceptualised sharing options which would allow experiencers to see how other people have interacted with or annotated the space.

Discussion

A core limitation to this approach – and I would argue, for the use of XR in activism at large – is that an immersive experience requires the willingness to engage in the first place. An advantage of disruptive action like Just Stop Oil’s blocking of motorways is that people who are not part of the activist movement have no choice on whether or not to engage. A material protest disrupts, and that is part of its efficacy. XR activism projects have to make a decision on whether they want to openly advertise their intentions, or deceive their audience. In the case of the former – if an application is called *Steal It Back*, for instance – they are likely to only reach people who are sympathetic to the activists’ views to begin with. Someone who does not support or wants to engage with restitution discourse is unlikely to try out an in-museum app which is called ‘Steal It Back’.

An alternative is to deceive the audience. This, too, is a well-established strategy in activism: when Extinction Rebellion protestors strip in parliament, or Just Stop Oil activists throw soup at a painting, they presumably do not advertise these intentions as they enter the building. XR activism can do the same, but since it is a deception by design which is repeated continuously, the ethical implications are different.

Firstly, it opens the question of what the immersive experience would be advertised as, if not as supporting the given cause. The discrepancy between the two is certainly central to how willing people are to engage, and potentially to donate, if that is the goal of the app. Secondly, there is a potential of this backfiring and people having similarly negative reactions to the deception as they do to ‘extreme’ measures of protest (Feinberg et al., 2020). Thirdly, depending on the roll-out of the app, an intended deception may not stay effective for very long, as word of mouth and information online are likely to supersede any narrative surprises in the long run. This, too, can have a negative effect on engagement and the activist cause at large: if people hear about an interaction as being deceptive without even having tried it themselves. Considering these three factors, the risks of deceiving users is likely to be more detrimental than helpful. However, this is not a binary decision, and calling an app ‘Steal It Back’ is perhaps on the other far side of the spectrum of options. For instance, if a future version of this prototype was more audio-based and encouraged dialogue with artworks, it could be called ‘Speak To Me’ without pointing in any actionable directions. Options are endless, but how a subversive narrative is advertised is an important decision to make in the process of creation XR for activism.

If an activist group decides to opt for something as blatant as ‘Steal It Back’, they need to not only consider how to motivate their target audience to use it, but which core message they wish to relay. In designing Version II, the interactive path repeatedly took me in directions which had not been part of the initial plotting. For instance, when planning a decision path, the alternative option for the intended main path was usually just a placeholder which I did not pay too much attention to. However, in turning the wireframe into a prototype, I realised that this

counterpoint is as crucial to the narrative experience as a clear point. This is why Version II turned out to be not as representative of the key points of *Breaking the (Virtual) Chains* as I had initially intended. After building it, I realised that following through it, the main actions are getting to the artwork and deciding what to do with it. From a conceptual perspective, however, the point I aimed to convey was a critical engagement with who holds power, and who should be wielding that power. A future version of the prototype could follow up the ‘stealing’ interaction with asking the experiencer whether they think they should be making this decision.

This prototype study demonstrates that a parallel development of a prototype and desk research can be an iterative process which pushes both outputs forward. This paper would not have focused on the same issues without the development of *Steal It Back*. This prototype study can be expanded in multiple directions: with other artworks, in other museums, with different activist questions, or with different interactive modalities.

Reflection

The integration of immersive technologies into activism faces significant challenges, primarily stemming from the ongoing tension between the optimistic claims of XR as an ‘empathy technology’ and the risks it poses in activist contexts. This tension can be a source of innovation, as both XR creation and activism thrive in decentralised, experimental environments. By focusing on connectivity, affectivity, and embodiment, XR can become a powerful tool for representing diverse perspectives and reaching broader audiences. As the boundaries between digital and material spaces blur, XR’s role in activism continues to evolve, necessitating further experimentation and adaptation. The framework outlined in this chapter aims to offer some orientation for future activist-XR endeavours, whilst emphasising the need for concrete, material actions to accompany virtual interventions. The experience of writing this chapter, as well as developing an iterative prototype alongside it, has convinced me of the efficacy of drawing on both practice-based and theoretical approaches to push XR scholarship further into experimentation, and translate decolonial approaches into concrete applications.

Chapter 8: Discussion

Critical Vandalisms

This Discussion addresses some of the crossovers between the chapters of this thesis, as well as a meta-level of this work which reflects on my position as an academic researcher and activist, and the interplay of Western academia and decolonial activism more broadly. Subsequently, it discusses my work in relation to Radical Placemaking and introduces the term 'Critical Vandalisms' as the form of allyship which this research seeks to propagate and contribute to.



Metadata x Empowerment

Metadata, often overlooked, plays a crucial role in shaping digital spaces, as it not only connects raw data points to reveal behaviours but also risks reinforcing discriminatory patterns if uncritically applied. The Blue_Tooth Spectrum and Facets of Space each explore community-driven XR approaches to metadata management: shared language for locality, transparent data, and collaborative, accessible databases to democratise spatial co-creation.

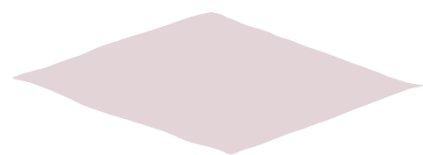
Metadata management is as divisive as Marmite: researchers either think it is the crux of shifting structural and institutional power dynamics, or they barely think about it at all. In 2018, the Facebook-Cambridge Analytica scandal brought the power of mass data collection to public attention: in the US, the company had an average of 500 datapoints on every single person (Hinds et al., 2020). This is data collected from people's usage of digital spaces and services. Data shows how often someone buys ice cream at a corner shop, which in itself does not seem threatening. It is metadata which turns this data into patterns, inferring buying behaviours and habits, health conditions and preferences. It is this form of connection building which poses various threats to privacy and other risks associated with Big Data. Metadata is the digital sphere in which strings become threads, and threads become weaves, and embedded in these emerging structures is knowledge, power, and money.

Since data has been called the 'oil of the 21st century' due to it being the most valuable resource in the world (Arthur, 2013), I will compare this to putting petrol into a car. Pulling up to a petrol station, there are distinct categories of petrol, labelled with numbers and letters, each at a separate price and in a separate container, for customers to choose from. No average customer looks into the tanks, nor probes the quality of the petrol. They trust the labels to tell them which type is going to make their car run, and which type is going to ruin the engine. In digital spaces, these labels which the average user puts their trust in are metadata markers. At first glance, a

photograph being mislabelled in a museum digitisation project may not appear as impactful as putting a petrol label on a diesel tank. In reality, however, categorisation approaches which replicate Eurocentric ways of knowing can be hugely detrimental to creating inclusive hybrid spaces. Discriminatory language, to provide an example, is proliferated far past its heyday through metadata which blindly replicates previous records. With the increasing use of AI in cataloguing and sharing metadata, uncritical replication becomes an increasingly pressing issue.

XR is bound to change metadata annotation in hybrid spaces, just as AI is changing the way metadata is generated and managed across digital platforms and applications. Spatial metadata management requires considering primary spatial data, the technologies which capture and log this data, and the people and algorithms who interact with the resulting data and metadata. Analysis, remediation, and moderation of metadata have a direct impact on user agency, which means that they can be used as tools for empowerment. Metadata may not be an obvious arena of activist intervention, but there is significant power in its perceived invisibility and apparent mundaneness. In the heritage sector, decolonial interventions to labelling practices have demonstrates this analogously (Van Broekhoven, 2023). By improving in-project workflows, building a language to communicate about spatial data and spatial experiences, as well as making existing information and research accessible outside of individual projects, digital labelling practices can form the foundations of user-generated content contribution and management. For spatial data, in particular, the incorporation of ‘ambiguity, open-endedness, contradiction, and plurality’ (Feinberg et al., 2014) presents a promising avenue for public mobilisation and empowerment.

Chapters 4 and 5 demonstrate two distinct, yet complimentary approaches to metadata creation and management. While they all aim to encourage community participation in spatial co-creation through XR, each chapter highlights a different priority. *The Blue-Tooth Spectrum* aims towards building a common language and a shared understanding of what a specific locality is, and what it does in relation to other localities. This is becoming increasingly prevalent as factual information on localities is mixed in with deepfakes, misinformation, and unverified sources in online spaces. Recent examples include an AI-generated image of a horizon-spanning refugee camp in the Gazan city Rafah, which was widely spread on social media as a legitimate image. With a metadata taxonomy as proposed in *The Blue-Tooth Spectrum*, the origin and fictionality of this image could be made transparent to users. Staying with this example, *Facets of Space*’s taxonomy could have then combined this image with other spatial information of the actual refugee camps in Rafah, allowing users to contribute both factual and anecdotal information in a shared platform. Both taxonomies reach beyond the development of a shared language and transparent categorisation approaches, however: they are intended as tools to navigate hybrid spaces.



Taxonomies x Hybridity

Chapters 4 and 5 both explore tools for navigating hybrid spaces, emphasising the limitations of traditional frameworks and the need for adaptable systems in immersive technologies. While the Blue_Tooth Spectrum is an academic tool focused on bridging theoretical gaps in XR for specialised applications, Facets of Space's taxonomy adapts these principles for public engagement, promoting local, community-driven data contributions in response to current Big Tech control over spatial data.

The Blue_Tooth Spectrum was co-developed with an architect who researches how immersive technologies can be used to create virtual memorials where there are none (Frayne, 2021). Our collaboration was based on a shared understanding of space and XR which we found not to be mainstream in HCI research. This chapter emerged from critical engagements with seminal texts of XR literature, gradually teasing out the gaps which existed between our respective lines of work and the theoretical texts which we were trying to relate them to. The *Blue_Tooth Spectrum* is an acknowledgement that in the fast-moving, globally interconnected digital landscape, theory needs to follow innovation. A key issue my co-author and I kept running into was that the established reality/virtuality binary was prohibitive rather than clarifying in the context of our work. The references I used earlier in my work for this were drawn from quantum physics, philosophy, and Spatial Studies (Baudrillard & Patton, 1995; Deleuze et al., 2002; Jacob, 2012; Tally Jr, 2020; Lefebvre, 1992; Rovelli, 2019), but there was a notable lack of these more fluid notions of techno-spatial hybridity in HCI research.

Beyond academic use, the *Blue_Tooth Spectrum* has great potential for being built out into automated applications. This could take the form of training an algorithm to position localities on the spectrum based on a relatively small qualitative dataset ($N \sim 200\text{-}300$). It could either work with spatial base data (3D scans, 3D models, mapping data, etc.), adapt non-spatial datasets (metadata of photographs, maps, documents, etc.), or a combination of both. Its core intention is to provide a navigational framing of localities for a present and future in which previously static delineations of spatial brackets are no longer as easily discernible. Immersive technologies are a crucial driver in facilitating this hybridity (Graham et al., 2022), which makes flexible, adaptable frameworks vital. The *Blue_Tooth Spectrum* is a step towards creating a shared language of spatial positioning which allows researchers from diverse disciplines to articulate where a site sits within 'glocal' spatial production.

While *Facets of Space's* taxonomy is also a tool for navigating hybrid spaces, it was created with more public-facing applications in mind. Rather than looking towards digital futures in ten, twenty years' time, it utilises already established, well-researched approaches (Weiland & Dachselt, 2008) to create a tool that is easily usable for lay participants. This consideration shifts the focus to an area of research which I did not discuss in my literature review: community-created wikis. Digital wikis have provided decades of reflections on collectively created databases (Bjork-James, 2021; Bruckman, 2022; Graham et al., 2015), and there is a vast array of HCI research into metadata creation, management, and use (Burney et al., 2017; Crystal, 2003; Dumais, 2018; English et al., 2002; Feinberg, 2012; Feinberg et al., 2014; Luque-Ayala & Neves Maia, 2019; Odom & Duel, 2018; Redmiles et al., 2017; Shaw & Graham, 2017; Star & Bowker, 2007; Yee et al., 2003). As *Facets of Space* argues, spatial data has different requirements from other forms of data and metadata, but its proposed taxonomy draws directly on the lessons learned from Wikipedia & Co. The current reality of Big Tech and major gaming companies controlling spatial data collection cannot be ignored, and neither can unequal contributions to platforms like

Wikipedia or Google Maps (Bjork-James, 2021; Bruckman, 2022; Graham et al., 2015; F. Ortega et al., 2008). The proposed taxonomy is intended as a tool subversive to this practice: it prioritises local engagement from a shared heritage perspective, and makes the processes of data contribution transparent to people who interact with the database. This presents a shift from contributing to a digital space as an individual, to generating a feeling of creating a digitally mediated community.



Transparency x XR

Facets of Space promotes transparency in community-created XR with a layered verification system distinguishing verified from unverified content, inspired by platforms like Math City Map. By accommodating diverse content types and fostering an early culture of transparency, it balances inclusivity with clear standards, enhancing trust and engagement in digital heritage projects.

A large portion of interest in heritage sites and local histories stems from a sense of connection between past and present generations, between visitors and locals (Su et al., 2020). This mirrors the early days of Wikipedia, in which a significant motivation for contributors was their work's visibility to other users. With the emergence of editing bots and their eventual takeover of wiki-based content creation across major forums, this appeal has ceased. The *Facets of Space* taxonomy is intended to retain this sense of digital community building, but this is only possible through efficient editing practices. The prevalence of bots on Wikipedia is largely due to the insurmountable amounts of additions in various languages, and the rise of misinformation through digital platforms (Arazy & Nov, 2010; Graham et al., 2015). Fully adopted into a public-facing platform which invites casual contributions, *Facets of Space*'s database format will need to vet information rigorously before publishing. However, in contrast to factual information platforms such as Wikipedia, factuality is not the only priority – rather, a clear differentiation between opinions, facts, and beliefs is essential. As *Rhodes Not Taken* demonstrates, departures from factuality can be an effective tool to invite public engagement with local histories, but the line between historical fact and conjecture has to be transparent. This transparency is a cornerstone of any tool which seeks to help people navigate hybrid spaces, which means there has to be a meta-level of the tool functioning as both a reflection on the space it is being applied to, and of itself. In *Facets of Space*, this meta-level is incorporated as the *Positional Stratum*. However, contributions to the envisioned database are not required to add to every stratum. Therefore, an otherwise valid and valuable contribution may very well forgo this aspect, leaving an editorial conundrum: is the new information included, removed from its context, or is it omitted to retain a standard of transparency?

The fact that filling in every stratum is not a requirement, and that the taxonomy is designed to be changed and adapted clearly, supports the former. There are a couple of possible solutions to prioritising transparency regardless: one is to enforce transparency by manually adding or automatically scraping contextual data. This approach is perhaps the most antithetical to the ethos of the proposed taxonomy. It would involve human moderators to add contextual data (e.g. 'this was submitted in 2022, while the site was under construction due to

renovation’) or for data scraping software to automatically provide it (e.g. ‘submitted in 2022, from Oxford, by a visitor, photo source confirmed to be on site’). The latter would arguably be invasive and forgo users’ agency over their data. This is an apt example for issues for which there are solutions which are widely used in various industries, but which would undermine the intentions of the tools proposed in this thesis. The aim is not to create a decolonially branded version of Google Street View, but to put agency and control over spatial narratives back into the hands of the people who live and interact with these spaces. Disregarding data scraping, the option of manually adding information also poses risks of misinterpretation, and could, if adaptation came anywhere close to a mediocreatively successful wiki, quickly overwhelm a small workforce. To avoid these issues, there are more dialogical ways of resolving transparency discrepancies.

One has been tried and tested by an early eduAR success, Math City Map. This educational application provides AR trails through the city of Frankfurt, Germany, in which experiencers solve math equations as they walk through town (Ariosto et al., 2021). Math City Map offers ‘official’, vetted trails in which the math has been verified, and the sites map onto the proposed interactions. They also provide a participatory option in which experiencers can add their own trails as ‘unverified’ paths, in which the math may or may not be correct. Other experiencers who select from the trails on offer can therefore clearly differentiate between ‘official’ and ‘unverified’ options. A *Facets of Space* database could adapt a similar approach, marking information as verified or not. However, this still leaves space for misuse of the app, which may be more of a concern in the contextualisation of public spaces than for math trails. The solution approach the treasure-seeking app GeoCaching (Geocaching, 2024) has for this is to require contributions to be submitted via their website before they can be added to the official app. There is still a layer of transparency in that creators of new additions are credited, but behind the scenes, GeoCaching controls which content is made visible to its users. The *Facets of Space* database could opt for a mixture of these approaches by requiring contributions to be submitted first, to be vetted for misuse, and then added as ‘unverified’ contributions, insofar as they are respectful of the intentions of the database.

An issue with this approach is that it recreates established paradigms of verification. If someone contributes an oral history which has been passed down through their family, they likely have little ‘evidence’ – by the standards of Eurocentric research practices – to back up their claim (I. Jackson et al., 2022; Nchindila & Corrigan, 2020). Labelling such a contribution as ‘unverified’ could delegitimise information which does not neatly fit into Western standards, counteracting the intention of creating this database to begin with. An option of circumnavigating this would be to create different types of contributions which are labelled in the database (e.g. ‘oral history’, ‘soundbite’, ‘photograph’, ‘article’), combined with automated timestamps. These could be organised as flat or hierarchical based on established HCI metadata management systems, such as Yee et al.’s (2003) faceted approach. Complimentarily, research into contribution dynamics of wikis has shown that transparency motivates transparency (Baltzersen, 2010; Caple & Bogle, 2013; Santana & Wood, 2009). If providing contextual information is optional, it is beneficial to ensure a relatively high density of transparent contributions in the initial phase of use (aka academic research and industry projects) to establish a culture of transparent contributions. This does not entirely eliminate the necessity of vetting for misuse, but it is likely to cut down on the workload for manual editing (Haider & Sundin, 2020). These considerations make apparent the difference in how the *Blue Tooth Spectrum* and the *Facets of Space* taxonomy are intended to be applied, and how they provide two complimentary, yet distinctive tools to navigate hybrid spaces.

Academia x Activism

This section explores the role of academia in activism, noting that while academic work inherently intersects with political issues, there is an expectation within academia to maintain institutional boundaries, particularly regarding controversial projects.

While some academics may not view universities as political organisations (Rose, 2017, p. 74), Robert Young (1999) argues that ‘academic work, whether it claims scholarly detachment or not, always forms part of a larger social and political nexus: the only question is towards which ends its own interventions are directed’ (p. 30). I would expand this question beyond the ‘ends’ to include the ‘means’: the ‘how’ plays a precarious role in academic activism, which is only exasperated by the use of digital technologies. A key takeaway from working with immersive technologies in this context has been that the intangibility of the proposed interventions is both a point of justification and contention. An intervention can seem ‘too soft’, meaning lacking radical material impact, from one perspective, and ‘dialogical’ from another. Especially in a contemporary information climate where the same political events are cast in vastly different lights by various media outlets, I was keenly aware of this position whilst working on the project. There is significant privilege in being able to speak about, with, and to social justice issues from within academia, but this privilege comes with limitations, too.

When I initially conceptualised options for *Steal It Back*, following projects such as Looty’s *Digital Heist* (LOOTY, 2021), the intention was much more focused on immediate material change. The most extreme version of this would have been an XR application which includes building maps, security camera locations, and display case information for a museum which holds stolen artefacts. The idea was to outline the fastest routes out of the museum, and options for contingency plans, to encourage experiencers to actually steal the stolen item back. This challenge was intended as a question of personal ethics: if you think stealing is wrong, and you would never steal this item yourself, why do we accept that museums did it and are not held responsible in the same way we would be held responsible? Or, if you think stealing from someone who has stolen something is ethical, what would you do after stealing an item back?

While the *Steal It Back* prototype ended up focusing on the latter consideration – the after, rather than the practicalities or risks of stealing – I was surprised at the comments colleagues of mine made whilst I was workshopping these considerations. The insinuation was that as an academic, I had a moral obligation not to produce a piece of research, or a visualisation tool, which would encourage people to break the law. These concerns were not raised to me as fears over liability, but as ethical apprehensions. The assumption was that as part of the academy, it is my shared responsibility to uphold existing institutional power dynamics. This includes, but is not limited to, museums being authorities on the management, storing, and displaying of cultural artefacts. As an academic, I am expected to not challenge that authority beyond words on a page which may be read by likeminded academics in the safety of a specialised journal.

It is crucial to underline that the concerns of my colleagues were not directed towards potential consequences for experiencers, either. An early version of the Rhodes application considered whether an interaction could include people vandalising the statue, virtually or materially. The virtual version was a roster of interactive options ranging from polishing the statue to turning it around, taking a hammer to it, or setting it on fire. This is the line of inquiry which led to the key ideas of *Facets of Space*, and its subsequent prototype. The other path, however,

would have provided experiencers with links to buying equipment like paintball guns or spray cans, and would have shown them good vantage points, ranges, and escape routes for material vandalism. Reservations on part of my colleagues focused mainly on the potential damage to university property, not on the danger that engaging in vandalism may put experiencers in. It was the encouraging of illegal actions which was considered unethical, not the potential repercussions for participants. To be fair to my colleagues, perhaps this was an underlying concern, but it was certainly never the first point to be brought up to critique this path.

Throughout many of these casual discussions, I maintained that because it was just a virtual interaction which, in itself, did not cause any material harm, how people acted on the information they were provided with was not the app's – or my – responsibility. There are easy counterarguments to such a blatant deflection of accountability, and I would not be undertaking this research if I did not believe that virtual interventions can lead to material change. The reason I did not take a more diplomatic stance in these conversations, however, was that I was curious about where my colleagues perceived this line of what was and what was not considered acceptable in the name of academic activism. Repeatedly, this arbitrary line seemed to only materialise when I had unwittingly stepped over it.

As an interdisciplinary researcher, ethical limitations to research endeavours are hardly surprising, let alone objectionable. The reason I quickly dismissed more radical forms of audience engagement was my concern for potential participants and the consequences which may come from unbalanced or too action-oriented information. However, what did surprise me throughout this project was that even discussing some of these options seemed to skirt an imaginary line. I got the overwhelming impression that academics can talk about action, as long as their critique is vague enough that they are not prescribing specific strategies for social change, and that they can double as activists as long as the institutions they protest against are not part of the academic-cultural complex themselves.

Barbara Rose (2017, p. 68) expresses her reservation that the term 'activist' 'should be reserved for those who have risked more, done more, achieved more in creating change' than her as an academic. I can relate to this reservation, as I see myself as a researcher first, even though the nature of my research is essentially political, and has activist applications. The intention of the chapters presented in this thesis is that they could be operationalised for a number of activist causes, which may be very different from the ones in my case studies, and for a variety of research directions which may have nothing to do with activism or decolonial theory. Regardless, the grounding of this work in decolonial theory and activism is essential to how it was developed. The order of decolonial theory to XR practice to activist application is crucial: an approach starting with specific activist movements, utilising XR tools, and then contextualising these with decolonial theory would have likely rendered a different set of projects. In fact, there were other practice-based projects which I worked on throughout this thesis which I contemplated including in this thesis.

One of them was a collaboration with the Oxford-based pacifist group OA4P (Oxford Action for Palestine) who had set up a solidarity encampment at the Radcliffe Camera (RadCam), one of Oxford's most prominent buildings, over the summer. The group placed banners and posters along the fence surrounding the RadCam, erected tents on the grass area in which people lived full-time during the encampment, hosted community events, assemblies, sit-ins, and various symbolic interventions to raise awareness about the ongoing violence in Gaza. When the solidarity encampment was disbanded on very short notice following an eviction request from the University of Oxford, the group had very little time to formulate a strategy for documenting their presence in this

space, and few options which were feasible to be carried out by the remaining group members. The potential of creating 3D models which made possible a future virtual recreation of the solidarity encampment was therefore a welcome option to carry their efforts into a different public space. I supported the group by creating LiDAR scans of the site, editing them, and making them available to the group for future use. In turn, they encouraged me to write about our collaboration in my academic work, which put me into a double bind.

On the one hand, I could recognise the research value of analysing the dynamics of our collaboration, on the other hand, I was concerned about how writing about it would change these dynamics. I used a co-creation guideline I had developed for a different project (see Figure 49) to define shared objectives and responsibilities at the beginning of this collaboration. The aim of this was for me to have a clear understanding of the group's priorities, and for group members to have buy-in later down the line. However, due to the high time pressure of the encampment being dismantled, this process was by no means as structured or smooth as if I had had weeks to conduct co-creation workshops and focus groups. Instead, I would describe the process as: the building is on fire, grab whatever you can on the way out (see Figure 50). It had nothing to do with academic rigor, but everything to do with the decolonial activist aims of this thesis. Repeatedly, this collaboration had me return to Paul Kivel's (1995, xxi) questions of 'What do you stand for?' and 'Who do you stand with?'.

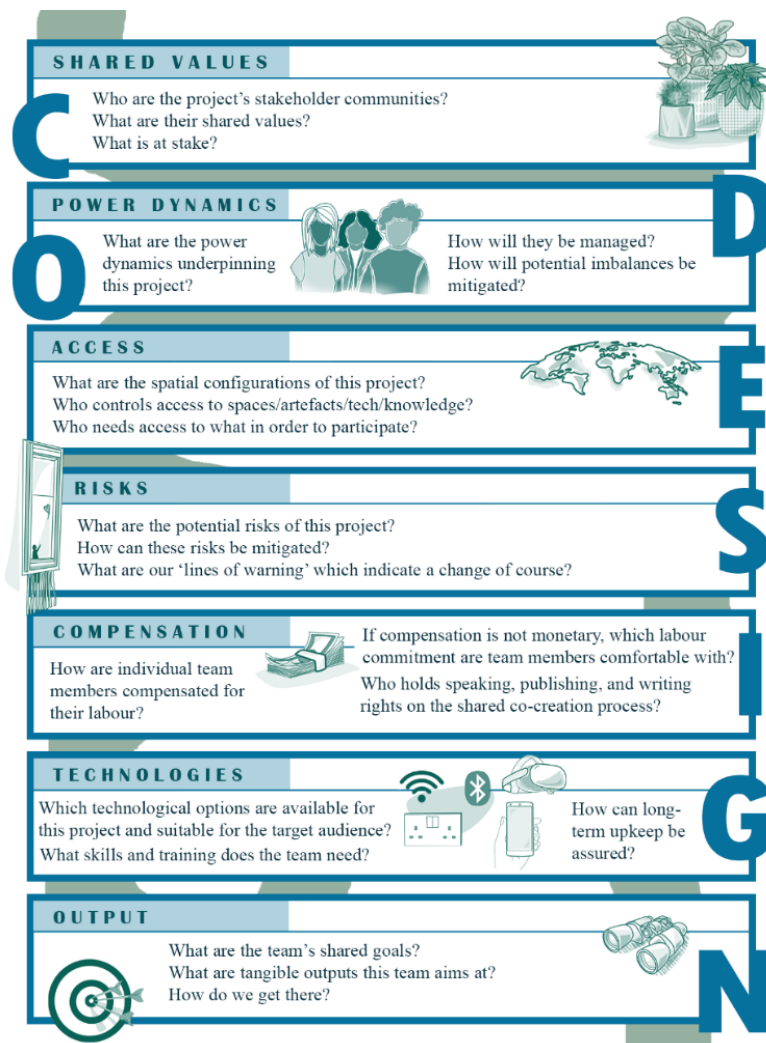


Figure 49: Guideline for inclusively co-creating XR content (Rivera-Carlisle, 2024).

I asked myself, as I was scanning the solidarity encampment while it was being taken down, using the same skills and tools I used on other research projects, whether I was a researcher now, or an activist, or a volunteer who merely *stood with* OA4P. For other academics involved in this mostly student-led movement, that line may have been easier to draw because their research did not necessarily overlap with their activism. However, many of these activists faced repercussions which were drastically different from the personal risks I was taking. As a doctoral researcher, I am technically a paying client of the university, not an employee. This afforded me an added level of privilege in expressing political opinions and engaging with activist movements without fearing for my job or academic standing. It was an unexpected realisation of having power in invisibility, in not being well-established, in not having an expectation of loyalty towards an institution thrust upon me. This made me reconsider my colleagues' concerns about radical designs as part of my work and whether, rather than having a moral obligation towards an institution, I have a responsibility to leverage the privilege of my position to advocate for those I stand with.

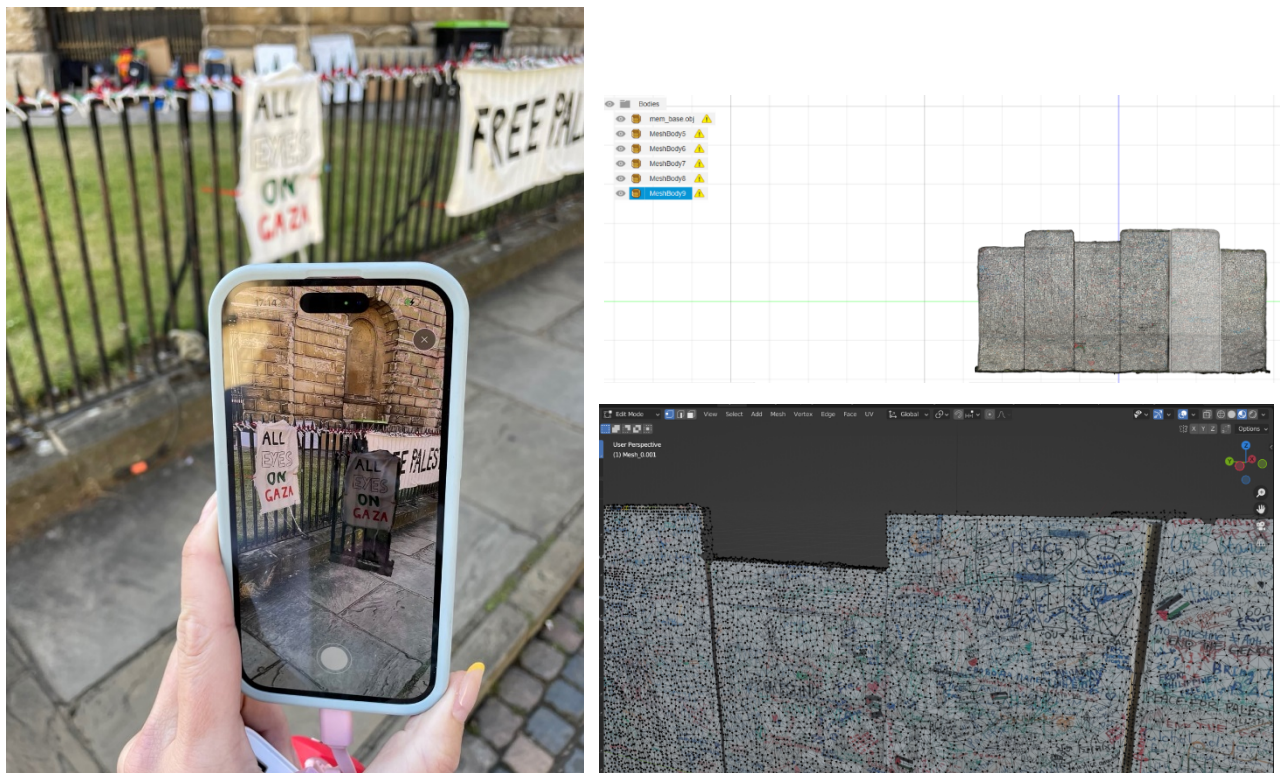


Figure 50. In-progress images of the scanning project with OA4P. Left: A scan of a banner which could be repositioned on any surface through AR; top right: a memorial wall with hundreds of signatures in Fusion360; top bottom: a close-up of the memorial wall mesh in Blender.

Decoloniality x Academic Activism

Academic activism in decolonial work is inherently limited by the structures it critiques, as academia often reinforces the Eurocentric norms it aims to dismantle. Despite these constraints, interdisciplinary efforts, especially in XR, provide innovative ways to engage broader audiences with social justice issues, challenges of inclusivity, tokenism, and the precarious balance between conforming to and critiquing institutional norms.

Aside from the limitations put on activism from academia, there are also limitations inherent to academic activism by virtue of its privilege (Kruks, 2005). From within academia, there is only so much activists can do to take down the bricks of the institutions which keep a roof over their heads. This is assuming the institution is part of the problem – which, in the case of decolonial activism, it definitely is (Cusicanqui, 2012). Decades of decolonial critique have addressed the central role Western academia plays in legitimising, propagating, and proliferating Eurocentric ways of knowing (Grosfoguel, 2013). Objectivity is a hallmark of this ethos, seemingly separating the researcher from their research. ‘The research speaks for itself’ is a much-repeated maxim, as if research knows how to speak, and is not crafted and constructed by the words of individuals who cannot be isolated from their positioning (Rose, 2017). Robert Zinn (2015) argues that the selection, simplification, and emphasis of how data is presented is ‘more than technical, it is ideological’ (p. 8). He states that the assumptions a researcher has to make about the needs of their audience is akin to that of a cartographer, who flattens complex spatial information into linear depictions of mountains, roads, and rivers. This mapping analogy can be applied to various academic disciplines, but is particularly relevant for work intended for non-specialist audiences.

In this project, I have striven to both contribute to interdisciplinary XR discourse, and create tools which may be used by non-specialists. Throughout this process, I have met many researchers who had an interest in using XR to increase the visibility of their work, but who lacked the translation tools to do so. Simultaneously, I collaborated with activists who had no academic motivation to further XR research, but who found innovative ways of appropriating XR tools with minimal technical knowledge. Both of these scenarios place a lot of power in the hands of the ‘translators’: those with the privilege of being able to invest their time into learning specialist skills, and deciding how to select, simplify, and emphasise. In wielding this power, the question of responsibility is directed towards the ‘ends’ these translations serve.

Decolonial discourse has been shaped by wieldy academic texts written by a few, privileged academics based at Western universities. They are, due to their academic work, no longer part of the disenfranchised communities they speak about. They exemplify Sonia Kruks’ (2005) argument that privilege can be operationalised to amplify voices which may otherwise be not be given room to speak. Silvia Rivera Cusicanqui (2012), in contrast, argues that the appropriation of decolonial thought through Western universities has created an alternative canon which follows the same lines of exclusion as Eurocentric academia. She states that this form of academic activism ‘entangles and paralyses their subjects of study: the Indigenous and African-descended people with whom these academics believe they are in dialogue’ (ibid., p. 102). Accordingly, decolonial thought is fundamentally incompatible with the institutional structures and practices of academia. ‘True’ decolonial activists must therefore stem from and be propelled from other spaces. While I do not disagree with this, academic decolonial theory also deserves credit for uniting a heterogenous multitude of independent movements under the notion of the ‘decolonial project’. Without this form of academic contextualisation, critique, and theorisation, subsequent generations of

activists may not have had the same connections, cross-threads, and shared language to utilise in their endeavours. I am keenly aware of the limitations of academically created tools for activism, but I appreciate their value regardless.

Especially with emerging technologies which are developed and appropriated irrespective of academic involvement, the rigor and internal accountability of academia can be beneficial. While contemporary universities are capitalist enterprises, and their funding structures are directly related to economic interests, there are pockets of genuine research inquiry which do not solely focus on how a tool can be turned into profit (Rhodes et al., 2018). Had I conducted this project as part of a team in a Big Tech company, the proposed tools would likely not focus on community interests and impact, but on how public involvement can lead to commercial buy-in, subscriptions, and paywalls. In *Race After Technology*, Ruha Benjamin (2019) references Facebook's early motto of 'Move Fast and Break Things' to invoke critical engagement with what happens to 'those broken places and people' (p. 8). While I would not refer to any community my work engages with, whether directly or from afar, as 'broken', the way I interpreted this challenge from Benjamin is to prioritise the counterpoints of tech-optimism. This thesis proposes XR applications as a potential approach to a number of long-standing issues, but with the caveat that only certain uses and structures stand a chance to support decolonial agendas. Rather than positioning XR as a toolset to 'undo' or relieve existing injustices, my work aims to highlight the 'subtle' (Llobera, 2007) forms of oppression which are embedded in our social, cultural, and built environments in order to develop an understanding of the complexity of the issues involved. Academia provided me with the frame and privilege to 'move slow' and focus on long-term support approaches over 'quick fixes'.

Part of that privilege is that in turning a critical eye to the very institution which is affording me this opportunity, I am not biting the hand that feeds me. I am not an employee who is paid for this research, and thus do not stand to suffer the same repercussions as professional academics, should my results dismay the University Administration. Regardless, the University is still a hand that guides me, and its rules and stipulations have shaped every aspect of this project. Barbara Rose (2017) calls this tension *liminality*, describing a space of negotiation between the different roles a researcher/activist juggles. In this liminal space, I do not just juggle the apples and figs which are my social scientist self and my activist self – my designer, programmer, historian, 3D modeller, cultural theorist, and heritage researcher selves are also up in the air. What I have learned throughout this project is that in order to do justice to all of them, they cannot all speak at equal volume simultaneously. There are paragraphs in which design perspectives take the lead, and others which are not intended for designers at all. In the tradition of academic cherry-picking – selecting the most relevant lines to feed into one's research, that is – I expect that people from various disciplines will be able to find their own path through this work, and decide which data points and perspectives are most relevant for their context. Rose states that in balancing academia and activism, 'each world is on a different side of a chasm that can't be breached' (ibid. p. 68). My work, however, aims to breach this chasm, to encourage multitudes and polyvocalities which are not easily essentialised or stored away neatly in a disciplinary box.

There is also a layer of precarity which comes with being as a doctoral researcher: as a junior academic, I am subjected to more scrutiny when it comes to conforming to disciplinary conventions. As a student, my work is assessed, as one of my professors phrased it, to give me the 'license to do research'. This precarity occasionally becomes visible, as it did during the boycott of the ACM CHI (Human Factors in Computing Systems) conference

in 2024. Before being cancelled due to the COVID-19 pandemic, CHI 2020 was set to take place in Honolulu, Hawai'i. A postponement of bookings shifted this setting to 2024 and following the devastation of Maui through wildfires in 2023, members of the CHI community called into question the appropriateness of hosting the largest conference in the HCI field (Appert, 2023) in a humanitarian and environmental crisis zone (Hester, 2023). On their protest website, the movement advised early career researchers who are not established within the CHI community to attend the conference regardless. They argued that for junior academics for whom supporting the boycott would mean that they would be excluded from CHI in the future – with less reputational leverage, they may not be invited back – this would be detrimental to the community in the long run. Rather, they encouraged early career researchers to attend the conference to network and become more established academics in order to then become a positive activist influence in the community.

Similar considerations apply in writing conventions – if a doctoral researcher wrote in the style of Walter Mignolo or María Lugones, for instance, their assessors would likely fail them. It seems that before you may break the rules, you first have to prove that you can play by them. These dynamics, whilst understandable from a perspective of ensuring research quality, are fundamentally antithetical to decolonial interventions, which seek to interrupt these types of gatekeeping practices (Grosfoguel, 2013). As much as being a doctoral researcher affords me privilege within academia, it also places burdens on me which more senior researchers are not necessarily exposed to (anymore). In *Complaint!* (2021), Sara Ahmed examines the interplay of precarity and addressing injustices and abuses of power in academia. She not only acknowledges the gendered, racialised, and classist dimensions of being seen as disruptive to institutional structures, but also the ways in which academics at different levels of seniority can use their privilege to amplify 'complaint collectives'. This has been a formative aspect of my experience on this project. Allyship and activism come in many different shapes, and learning how to find likeminded people who can support a cause in their own realm of influence is one of the most fundamental steps to facilitating change from within the 'Master's House' (Lorde, 1981).

A few years ago, I met the head of a university department who told me she accepts all applicants who come from countries with active conflicts, because this allows them to procure a visa to get out of immediate danger. From my perspective, this is activism akin to administrators and civil servants who used their positions in the 1930s to enable Jewish refugees to leave central Europe, saving their lives (Kotlowski, 2013). And yet, this professor did not view herself as an activist, but rather as an academic responsibly utilising the power bestowed on her as an educator. It was encounters like this which encouraged me to look for these pockets of social justice work within academia, despite my own efforts sometimes feeling like fighting windmills. It was academics who chose to change their syllabi towards truly inclusive, multi-perspectival educational programmes, or who stepped away from the citation lists they had been using for decades to critically examine whose voices they were amplifying, or who stopped using a word entirely because they had recently learnt of its discriminatory origin. A core aim of my work is that XR can translate these small and large anecdotal efforts beyond the realms of academic critique, and make them accessible to wider audiences.

There is a gendered dimension to the limitations inherent to this work, too. Despite my significant privilege, I must also acknowledge that following decolonial scholarship away from Eurocentric research traditions is challenging a tradition which women have historically been excluded from (Husu, 2001). Steering away from the notion that Reason and rationality are male-coded, and emotions and feelings female-coded is an ongoing

development which persists in contemporary society with astounding obstinacy (Hey, 2011). As a female-reading scholar, opting for a decolonial approach which manifold ways of knowing, values emotive historical accounts, and acknowledges emotions as part of people's decision-making processes is, inadvertently, also to undermine one's own suitability for mainstream academia. This echoes Ahmed's (2021) assessment that it is often junior academics from historically excluded groups – namely first-generation scholars, womxn, People of Colour, First Nation scholars, and researchers from economically disadvantaged backgrounds – who challenge existing structures, marginalising themselves further. Already seen as 'outsiders' to the traditional academic space, scholars embodying these positionalities constantly face a conundrum of having to prove themselves more than their colleagues in order to fit into a system which was, ultimately, not designed for them (ibid.). A fellow student compared this to being a cyclist on roads which were created for cars – there is increased vulnerability and complexity, but the responsibility for navigating these challenges lies with the individual at risk. Based on my experience, this risk, as well as the toolsets of navigation which a Western academic environment provides is dependent on one's disciplinary branch.

Being positioned in a Social Science department, I perceive a responsibility to share the openness to interdisciplinarity and experimental approaches which I have experienced in other academic contexts. There is a sense that one can be 'too artsy' for Social Science, but one can hardly be 'too social-sciency' for art – because artistic strands of industry and academia embrace a radical openness to innovation and experimentation which many other disciplines lack (Lockward, 2019a). Spatial Studies is an equally open area of critical inquiry which spans so many disciplines and applications that it resists academic pigeonholing (Tally Jr, 2020). Decolonial theory is quite the opposite, sitting in a distinct space separate from many disciplines, yet cutting through their Eurocentric foundations horizontally. In this sense, decolonial theory is interdisciplinarily applicable whilst being firmly positioned within cultural and literary theory. Its inherent intersectionality, however, creates a multiplicity of generative overlaps which have allowed me, throughout this project, to draw on a wide range of social justice-oriented considerations.

While there are various prevalent interpretations of the decolonial project's core aims, for my work, the most relevant has been its focus on centring hegemonically excluded and silenced perspectives. Questioning who is most vulnerable in relation to a technological intervention, who is being disadvantaged by 'progress', and who has historically been rendered invisible in shared spaces has been central to this project. Tokenism is one of the key fallacies XR interactions can easily reproduce: an immersive experience may *look* like it engages with a community, or may have involved input from a marginalised group, yet may not address the underlying power dynamics which govern this involvement. The point of my proposed approaches was not to test them with one community and get a tokenistic stamp of approval. Rather, these strategies seek to shift the conversation to the power structures which underpin decolonial content in XR. To discuss these strategies, and how they work together, the next sections will reflect on the interplay between specific chapters of this thesis.



Spaces x Decolonial Academic Activism

As the role of critique in academia evolves, radical and dialogical forms of placemaking become central to positioning oneself as part of a community, an accomplice, or an ally. By facilitating 'critical vandalisms', this work seeks to foster dialogical allyship and challenge hegemonic spatial narratives.

A follow-up question to the changing role of academia is whether there is still a space for critique as a form of checks and balances in society. This is a similar consideration to that which journalists face in the age of digital information – is there still a role for more elite forms of critical engagement, intended as guideposts for the rest of society? From a decolonial perspective, this is a complex question, because the essence of decolonial critique stands against the proliferation of Eurocentric, Western, White, elitist prerogative. However, with digital media culture being propped up by these same values, constantly reproducing epistemic violence, perspectives from educational elites can provide a constructive form of allyship. They can just as easily be detrimental to decolonial efforts. But that is almost the expected line of argument – decolonial activism is anti-establishment because the establishment has, historically, not supported them. The potential of inverting this separation is a relatively recent development, and the paths forward are anything but clear.

Gonsalves et al. (2021) describe the practice of *radical placemaking* as the utilisation of 'critical, creative, and hybrid placemaking methods by local and marginalised communities to voice place-based issues and advocate for social justice' (p.2). Similar to Laenui's *Processes of Decolonisation*, the intended audience for this concept are people oppressed by spatial injustice. Complimentarily, Gonsalves et al. outline 'radical accomplices', who 'are focussed on enabling others to take control of their environment, learning from difference, engaging in radical listening and ultimately, becoming a socio-cultural animator enabling others to occupy "hybrid places"' (ibid.). These accomplices are distinct from allies in that they are embedded in the community and face the same risks as community members. Reflecting on these notions of radical positioning, and comparing it to a movement like OA4P, gaps quickly emerge. If a community is not defined by its shared risks, then community members, accomplices, and allies merge in ways which radical placemaking does not seem to account for. However, interpreting this concept more broadly, one could see on-the-ground protestors as the community, people who advocate for them from within the university as accomplices, and people who support them with little risk to their own safety or standing as allies.

In this stratification, the type of academic activism which this project falls under is a form of radical allyship. However, I view the work in this thesis as dialogical, rather than radical: a form of allyship which utilises existing tools to support more diverse, inclusive ways of placemaking. In the early stages of each prototype, I did entertain more radical approaches to XR interventions. For the Rhodes statue, for instance, an alternative to critical counterfactual histories would have been to encourage people to engage in virtual vandalism (see Figure 51). Experiencers would have been invited to virtually interact with the Rhodes statue however they wanted: draw on it, set it on fire, turn it around, polish it, take a hammer to it, put stickers on it, create a plaque for it, etc. I partially stepped away from this option because there were a lot of editorial choices to be considered which lay too far removed from my main line of research inquiry. To address my research question for *Rhodes Not Taken*, counterfactuals were a more efficient way to achieve *critical* engagement, rather than just gamify some form of engagement with the statue. Additionally, building a set of practice-oriented tools carries different risks from

writing an analytical paper. There was a concern of normalising or encouraging material vandalism through virtual interactions in XR. Another option would have been to lean into the latter: rather than facilitating virtual vandalism, an XR app could also be used to *encourage* material vandalism, if that was a movement's goal. I particularly considered this option in relation to the *Steal It Back* prototype. Several decolonial interventions to Western collector museums have proposed stealing back stolen or looted artefacts as a form of social justice (Adebayo, 2024; Durie, 2024; Schug, 2024). An XR application could be facilitate this in various forms.

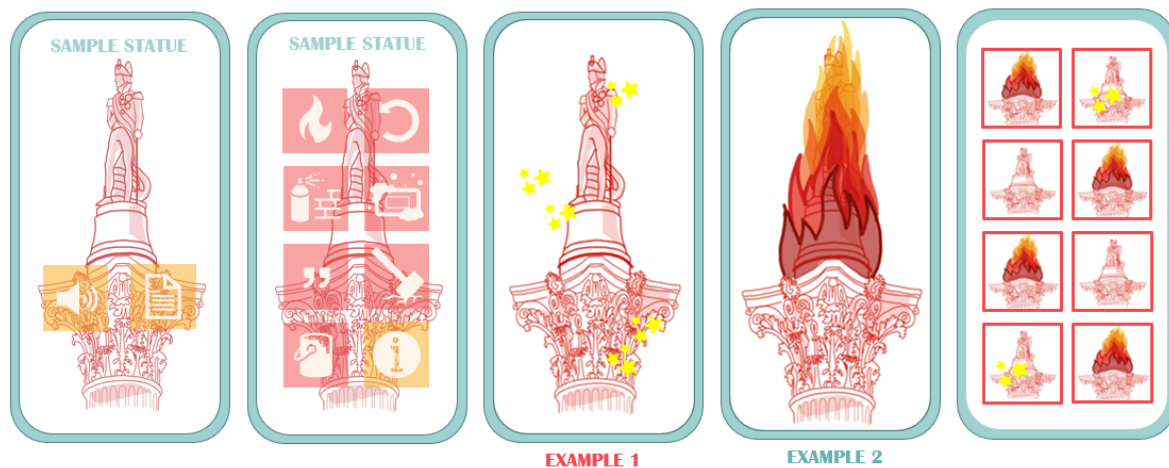


Figure 51: Virtual vandalism options in Nelson's Column wireframe.

Through my work, however, I aim to support *critical vandalisms* – acts of virtual alterations of space which are based on critique. This is partially a move away from a removal/maintenance binary, and partially an interpretation of Laenui's *Dreaming*. I take the author's caution that *Dreaming* should not be rushed seriously, and acknowledge that in the same way that Language Games complicate communication (Wittgenstein, 1989), a lack of shared imaginary is detrimental to finding innovative solutions. Anyone who has ever tried to picture a new piece of furniture in their home can likely relate to how difficult it is to envision even small-scale spatial change without three-dimensional reference materials. If a long-term aim is to co-create shared spaces which are representative of a multiplicity of perspectives, we need tools to visualise these spaces, to make them heard and challenged and understood by as many people as possible. For me, the point of facilitating critical vandalisms is to collectively exercise audio-visual critique and connect it with implementable material change. This is a form of resistance to hegemonic spatial narratives and a possible path to connective action through immersive technologies.



Critique x Vandalisms

By fostering critical, aesthetic, and subversive engagements, XR can bridge resistance outside institutional structures with systemic change from within. This is a form of critical vandalism which emphasises allyship and connective action for enduring spatial justice.

When a new medium enters the mass market and reaches wide-spread adaptation, there is always an adjustment period in which the rules of how they can be used are not hegemonically defined. The early days of ‘cyberspace’ and the tech-optimism associated with this time period attest to the hope which comes with the emergence of new communication tools. In their brightest light, emerging technologies hold the potential to challenge existing injustices and provide a level playing field for cultural production going forward. However, as seminal texts such as *A Rape in Cyberspace* (Dibbell, 1994) or *Race in Cyberspace* (Kolko et al., 2000) aptly demonstrate, the historical precedent is that new technologies quickly become replicators and amplifiers of existing issues, rather than their antidote. While immersive technologies are not technically new, they are still in an early enough stage of mass adoption that there is space for rule-making innovation. From my perspective, it is vital that this innovation focuses on inclusiveness and polyvocality in a dialogical way. Information siloes and political divisiveness are already rampant enough in digital spaces (Forte et al., 2014; Gamage et al., 2022; Krafft & Donovan, 2020) that reinforcing a destruction/maintenance binary is not necessarily productive.

While vandalism has its place in resistance and protest movements, it must be acknowledged that it is easier to destroy than to build. As per Schopenhauer’s (alleged) quip that any foolish boy can crush a beetle, but all the professors in the world cannot make one, the repercussions of destruction, especially from an academic perspective, should be considered thoroughly. Historically, there has been an assumption inherent to every revolutionary movement that whatever comes after the destruction of the current system is going to be better, more just and egalitarian. From the fallout of the French Revolution to George Orwell’s fictional pigs becoming humans in *Animal Farm* (1945), from Facebook’s ‘Move Fast and Break Things’ maxim (Nakamura, 2020) to early cyberspace hopes to ‘leave our bodies behind’ (Kolko et al., 2000), the realities of post-destruction rebuilding tell a different story. Therefore, it is vital to think about the *after*, like Laenui encourages, to foster collective imaginaries, and to link these visions of a different future to material action.

While this thinking and Dreaming can happen in multiple spheres of cultural co-production simultaneously, XR’s relative novelty to mass usage as well as its capabilities as a ‘hypermedium’ (Cegys & Weijdom, 2020) make it particularly suitable for this task. It can not only encourage people to virtually dismantle the systems they know, but motivate them to actively contribute to a discourse on what a new system may look and sound like. Defining what the core pillars of such a speculative system may be is the essence of practice-oriented critique, and draws back to earlier, more functional versions of public involvement in democratic processes. Crucially, it neither engages in a simplified gamification of complex cultural issues, or offers simple absolution through cathartic virtual resolutions. As discussed in *Breaking the (Virtual) Chains*, this is a challenging line to walk, given the application of XR technologies in various industries and areas of research.

The lack of established rules around XR use is also an invitation for experiencers to engage in ways they would otherwise not – for better or for worse. A lesson certainly learnt from previous technological ‘turns’ is that people tend to behave differently behind the guise of virtual identities in digital spaces that they would dare to in material

spaces. As examples of in-game activism show, this anonymity can be utilised to subvert and protest against existing systems (Cermak-Sassenrath, 2018; Davies, 2020). On the flipside of this potential are replications and amplifications of abusive behaviours across digital platforms. A key takeaway from my work on this project is that these negative potentials exist and persist irrespective of whether there are positive counterparts – if we lean back and do not build systems which prioritise marginalised and vulnerable communities, they are all but guaranteed further exploitation. XR interventions on their own may not be enough to turn cultural tides, but they certainly do not need to be tools in the arsenal of intergenerational oppression, either.

Of the precarities embedded in this discourse, how subversion is treated within an immersive experience is one of the most sensitive to balance. Applications like *The Unfiltered History Tour* (2021) and video games like *Fairgame\$* (2024) demonstrate a public appetite for subversive narratives. In an age of anti-hero popularity, subversion can quickly become a branding strategy. This is not inherently problematic, but in activism contexts, it is vital to connect these subversive narratives for experiencers with material impact for affected communities. The foundation of this chain of impact is multi-perspectival information and knowledge sharing. In the study on sites of colonial exploitation in London which *Facets of Space* references, I repeatedly encountered that participants were more concerned with the aesthetics of buildings and memorials than their contextual meaning. For instance, the Lloyd's of London building, a grey and silver brutalist structure, stands where the headquarters of the East India Company used to be situated. In a swipe-through-time prototype which showed different iterations of the headquarters and their subsequent replacement by the Lloyd's of London building (Figure 51), participants predominantly focused on which building's architecture they preferred. Without contextual information, their concern was not for a lineage of spatial manifestations of colonial power, but for a perceived loss of architectural beauty.



Figure 51: AR overlay of the previous Headquarters of the East India Company with the Lloyd's of London building which now stands in its place. This was part of a prototype developed during my MA research.

Material vandalism disrupts established aesthetics – sometimes in a destructive manner, but in the case of graffiti, for instance, also with an aesthetic language of its own. The history of graffiti as a form of resistance and protest which eventually became to be considered an art form is exemplary for this shift. As Thomas Markussen (2013) argues, there is potential in using the power of aesthetic languages to support activist causes, but there is also a risk of appropriation which absorbs protest aesthetics into the dominant culture. The reverse, however, is also possible: a cultural problem like White Saviourdom can be appropriated against the dominant culture, making it function for decolonial efforts. This sits along the same ethical lines as stealing back a looted artefact in order to return it to its origin community. Depending on one's own positioning, this may be perceived as just or unjust, but irrespective of morality, it is, under current legislation, illegal. It is therefore essential to keep in mind that laws are rules which were made up at some point, for a specific purpose, and rules can change as society changes.

Reframing the British Empire as exploitative is not radical, but it is a rupture to a prevailing hegemonic narrative which excuses Imperial violence through White supremacist reasoning (Gildea, 2019). The aesthetics which are linked to this reasoning continue to exert their power over our collective imagination, even if we acknowledge the violence of Empire. Part of the strategic toolkit for XR activism should therefore be a questioning of the aesthetic language immersive technology innovations are collectively building. Activism which appropriates the aesthetics of oppression can borrow some of its power and invert its intentions, but it also risks becoming absorbed into hegemonic culture. Balancing acts of resistance, protest, and performativity is a collective challenge, but one that manifests in individual choices. In academia, this is akin to citation practices: as scholars, we constantly make choices of whose voices we amplify through our citations, who we provide a platform for in our research, and whose vulnerabilities we draw attention to. While one's level of power and privilege within academia influences to which degree this can be implemented in individual cases, this is one form of resistance and critical knowledge reproduction which is built into the system we operate in. Systemic change can come from these individual acts of defiance and critique, and immersive technologies offer an opportunity to extend these to a connective level.

Historically, legislative changes have been built by protests outside of institutional power structures, but implemented from within them. The suffragettes campaigned for women's voting rights, but it was male members of parliament who actually passed these rights into law. The civil rights movement in the US led to legal changes, but these changes, too, were voted on by White delegates of parliament. This is not to withdraw any credit from civic protestors – without them, parliamentarians certainly would not have voted for these changes – but to underline that convincing those benefitting from existing institutional power structures is essential to achieving legislative changes. The opposite is true, too: following the BLM protests of 2020, the UK government changed legislation around public monuments and protesting. However, they did the opposite of supporting the movement – they made prison sentences for vandalism against statues longer (Barrister, 2020; Hyde, 2021) and limited protesting rights in the UK (Bolton, 2024). Therefore, it is essential that counter-system resistance also makes use of in-system resistance, and that this resistance is visible, accessible, and connective.

Academics are in a position of privilege which allows them to not only map the boundaries of this interplay, but to provide blueprints for effective collaborations. Sonia Kruks (2005) argues for wielding privilege as a form of alleviating the emotional and educational labour which has, historically, been placed on those marginalised by existing systems of oppression. Accordingly, those who hold maximum privilege and power within the system

should carry the largest responsibility for performing this labour. This form of allyship can mean the difference between a flare up of long-standing protests against systemic injustices, and lasting change. I view critical vandalisms as this form of allyship: an acknowledgement of one's privilege and power, and action towards using them to amplify, support, and carry educational and emotional labour for those persistently disadvantaged by systemic oppression. In negotiating my position as an academic/activist, as a designer/historian, as a researcher/developer, it is this allyship which I perceive as the chief responsibility of my work.



Conclusion

And Coloniality Shall Have No Dominion

This thesis opened with a snapshot of the media discourse surrounding recent decolonial efforts in the UK: the denial of institutional racism on part of the previous government; a national heritage institution being reprimanded for acknowledging its ties to colonialism; and the legislative repercussions of statues being toppled as part of the 2020 Black Lives Matter protests. This snapshot served to illustrate the ways in which spatial enactments of Coloniality intersect with ideological divides, and as a reminder that progress is – more often than not – one step forward, three steps back. In engaging with decolonial activism and allyship, I view it as essential to keep an eye on the possible futures while in the present, change may not be visible to the naked eye. If we imagine a government which openly acknowledges institutional racism, for instance, then we can imagine policy plans which make combatting racial inequalities a key objective. If we imagine national heritage institutions not just acknowledging their colonial pasts, but actively returning looted artworks, we can imagine an international network of institutions which sees and interacts with Britain in an entirely different way. If we imagine mass protests and toppled statues leading to a removal of White supremacists, slave owners, and Imperialists from our public spaces, we can begin to discuss who we would rather see in those spaces, whose spaces these are, and who should be involved in their co-production.

In this thesis, I have argued for different forms of collective imagining: to challenge our perceptions of shared spaces, to work towards wiki-esque co-creations in annotating spaces, to use counterfactuals to conjecture on possible futures, and to draw lines between honourable intentions and tangible outcomes. While I have discussed these options in relation to XR, my prototype studies have mostly focused on AR applications. This is mostly due to the site-responsive rooting of my work: to design *for* a space, ‘rather than around it’ (Wither et al., 2010, p. 46), AR is particularly suitable to incorporate both material and digital elements, thus accentuating the ‘place-producing dimensions of an experience-driven application’ (Engberg, 2017, p. 3). An argument of AR over MR, for this project, was the wide accessibility of AR functions on mobile devices, in contrast to MR interactions which would have required more specialised equipment. While I acknowledge the potential affordances of other XR applications to facilitate remote access, my focus in this thesis was on ways to engage diverse audiences on-site. While the conceptual contributions of this thesis speak to broader XR scholarship, this spatial situatedness, and thus prioritisation of AR is a limitation of its practice-based output.

Thinking ‘through’ (Gilquin & McMichael, 2008) immersive technologies has been instrumental to this process. It has allowed me to stay experimental with both my theoretical and practice-based inquiries, and to push past the most obvious or commonly taken routes of exploration. In engaging in research-through-XR, this thesis demonstrates a few possible options of how immersive technologies can be operationalised as research tools. Throughout this work, XR serves as a theoretical grounding, as a means of academic inquiry, as the tool with which answers are gathered, and as the creative output resulting from that research. Therefore, the iterative processes presented in the chapters are not directly replicable. If another researcher were to apply the same principles to a different site, they would likely come to different conclusions and face different challenges. That is very much the point of experimental approaches to XR research – many of the XR projects cited in this thesis

have very little overlap with my work in terms of content or key objectives. And yet, they have shaped and guided my work through their failures and triumphs. This thesis aims to make a similar contribution in that its learnings can be translated into a variety of XR-related contexts, as well as some applications in decolonial activism, Spatial Studies, and HCI research.

The more our material environments become blended with virtual information, the more prevalent questions become about how we digitally annotate, document, and preserve spaces. While not everyone will be wearing AR contact lenses in ten years' time, the fact that a majority of internet users are presently accessing the Web from their phones (Shanahan & Bahia, 2023) is an indication that mobile devices play a key role in how people interact with hybrid environments. This, in turn, spurs innovation in relation to interaction-based engagement and the gamification of information (Dahalan et al., 2024). Even heritage spaces which currently do not offer on-site digital engagements do try to gamify information dissemination, especially for younger audiences, in order to cater to entertainment expectations and attention spans (Çetin & Erbay, 2021; Dahalan et al., 2024). Part of this increased focus on interaction is the more general online tendency towards user-generated content, which seeks to engage people through their active co-production of digital content (Lavan et al., 2020). Analogous to this, more and more heritage institutions are looking to co-creation strategies in order to incorporate community knowledge and engage populations who are traditionally underrepresented in heritage spaces (Barnes & McPherson, 2019; Morse et al., 2021). For public spaces, however, this responsibility falls to everyone and no one. Thus, I view it as a shared responsibility of academia to produce strategies which foster the collective co-production of hybrid spaces with a focus on communities and individuals, rather than commercial conglomerates and corporations. This thesis is intended as a contribution to this effort: it provides an operational toolset to leverage XR interactions for decolonial engagements with public environments.

The tools in this set can be used individually or in concert. First, *The Blue Tooth Spectrum* encourages new ways of thinking about and through spaces by providing eleven axes to position localities in hybrid space. It builds on contributions from Skarbez et al. (2021) and Stapleton and Davies (2011) to further the HCI practice of reality/virtuality taxonomies for XR. Second, *Facets of Space* builds on HCI research into conceptual metadata management structures, specifically drawing on Weiland and Dachsel's (2008) *Faceted Folders System* and Susan Dumais' (2018) *Faceted Search*, to create a conceptual taxonomy for the transparent, transferable, and structured analysis and sharing of spatial data. In applying this taxonomy to the site of the Indian Institute, and building a prototype based on this application, this chapter demonstrates a direct translation of conceptual research to XR application. A core contribution of both chapters is that their respective taxonomies can be adapted to various research contexts while retaining transferability between different uses and iterations.

Third, *Rhodes Not Taken* contributes to an experimental branch of critical historiography, building on Niall Ferguson's (2011) and Robert Cowley's (Bradley & Cowley, 2001) work. The approach taken in this chapter, however, is a novel take on virtual histories, as is the prototype study based on this analysis. Within the thesis, the aim of this chapter is to demonstrate the potential of applying experimental approaches like virtual histories to critically engage lay audiences with spatial Coloniality. Additionally, *Rhodes Not Taken* provides in-depth insights into the political, financial, and spatial implications of its case study site, the Rhodes statue at Oriel College, Oxford. Fourth, *Breaking the (Virtual) Chains*, directly builds on Poka Laenui's (2006) *Processes of Decolonisation* and Gonsalves et al.'s (2021) notion of Radical Placemaking, as well as Kari Kēhau Noe's (2021)

XR design work. It provides a strategic framework for aligning virtual social justice interventions with material change, and details a prototype study which demonstrates the potential of centring material impact on marginalised stakeholder communities in heritage-centric XR design. Using the Haida Octopus Helmet from the Pitt Rivers Museum in Oxford, UK, as its case study, this prototype, *Steal It Back*, demonstrates an experimental approach to engaging lay audiences in heritage restitution discourse.

Collectively, these four chapters' contributions are intended as a practical toolset, as answers to the question of how immersive technologies can be operationalised to contextualise spatial enactments of Coloniality, and as encouragement for other academics to be experimental and explorative in their critical inquiries.

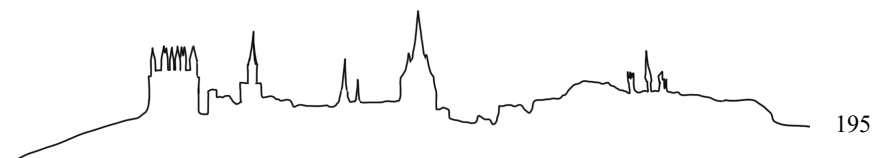
This thesis suggests that academics are well-positioned to engage in *critical vandalisms* – acts of allyship which leverage virtual critique to facilitate long-term material change. In order for these endeavours to be effective, one of the most urgent perspectival shifts is to accept that the Enlightenment ideal of educational and cultural institutions representing a benevolent Commons does not align with the realities of academia. Contemporary universities and heritage institutions are commercial enterprises which prioritise capitalist interests. While they may not always be purely profit-driven, branding and financial longevity are core pillars of their long-term strategies. Therefore, asking how compensation, budgets, and maintenance costs fit into decolonial initiatives is essential in order to collaborate with institutions, or engage in decolonial work from within. Considering who benefits, whose needs are being prioritised or, in turn, neglected, is a key step to operationalising critical self-reflection in academic activism. Bringing this in dialogue with immersive technologies, this also entails asking who is creating, controlling, and distributing spatial data, and for whom.

Britain's colonial history necessitates institutional responsibility both at home and abroad, and a prioritising of community interests in negotiating digital heritage preservation and presentation. However, who these communities are, and in which order their needs should be prioritised, are rarely simple questions to answer. Therefore, it is crucial that reflexive work is done at an academic meta-level, considering strategies of communication and managing power dynamics between diverse groups. This also entails an acknowledgement of cross-connections to other realms of digital culture and their impact on how XR is being developed across various industries and areas of research. With the emerging prevalence of AI (Artificial Intelligence) at the backend of various digital interactions, for instance, the need for diverse, multi-perspectival approaches becomes even more pressing. While the core concerns of this thesis have been relevant issues for decades, there is a renewed danger in absorbing existing colonial value systems into yet another society-shaping technological 'turn' through various forms of AI (Noble, 2020). Together with the rising popularity of XR applications, this could be a decisive factor in shaping the digital landscapes of our collective future. Decolonial approaches are particularly helpful in mitigating these interlinked, multi-faceted risks: they can provide the conceptual means to not just tackle one technology at a time, but to create transferable blueprints for various hybrid interactions.

In the absence of governmental initiatives to decolonise public spaces, and in light of a media discourse which polarises colonial legacies, XR presents a promising avenue of decolonial resistance. This thesis advocates for a close connection between academic critique and decolonial social justice activism through experimental XR interactions. As academic researchers, we are currently creating the pre-conditions for future technologies, interactions, and critical engagements. If we ask now who XR interactions are accountable to, who profits from them, who they represent and whose knowledge they reproduce, we may pave the way for XR infrastructures

which question, rather than reproduce colonial valorisation systems. Even if we fail, XR experiences can, at the very least, support collective imaginaries of a future in which different paths are open to us. In order to facilitate these imaginaries and the possible futures they may contain, it is essential that the ways in which we employ XR in our research is respectful of multiple ways of knowing and learning. Without an openness to thinking outside of the box, and listening to the person who can see the sides of the box which we cannot see, immersive technologies may just as easily become another echo of the same Eurocentric tune which academia has been singing for decades. Fortuitously, decolonial XR marks the spot where academia and emerging technologies may symbiotically reshape each other's structures to combat long-standing inequalities and lines of exclusion. If leveraged thoughtfully, their intersection can shape individual perceptions and drive broader societal change, thereby offering a powerful pathway for decolonial praxis.

Utilising an interdisciplinary framework, this work provides a versatile toolkit for scholars, activists, and communities to engage in constructive dialogue, foster inclusive narratives, confront the power structures inherent in our shared environments and facilitate critical vandalisms. Its contributions are designed to be taken out of their respective boxes to be examined, adapted, and changed into other forms of research-through-XR. I view them as spots on a map which is only just becoming tangible, marking intersections of roads yet untravelled. Therefore, navigation is challenging: it is difficult to judge which path to choose, and when to decide to switch to a different one. However, this uncertainty of experimental work is, paradoxically, also its affirmance. No available path is as daunting as the possibility of never making a choice and thus losing every possible path. This forms a parallel to decolonial activism: when facing systemic issues, the sheer breadth of possibilities to intervene is staggering, but simultaneously, it is difficult to begin because no single option promises to be enough. The beauty of this dilemma, however, is that one cannot go wrong, as long as we are reflective, thoughtful, and respectful of multiple ways of knowing. Any step towards a decolonial future, however small, is an act of *Dreaming* (Laenui, 2006), a form of resistance, of imagining alternatives, even if it is followed by three steps backwards. All we need to do – as academics, activists, designers, developers, researchers – is to pick a spot on the map and follow the path, trusting that a map will eventually emerge, and that there will be others who come to the same future from different paths, and that together, we can carry the bricks of the road which will lead us there.



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Appendix: Disclaimer Nicholas Frayne

Cambridge, 12 December 2024

To whom it may concern,

I hereby confirm that I, Nicholas Frayne, have co-authored the article ‘The Blue_Tooth Spectrum: A Framework for Positioning Localities in XR Experiences’. Joanna had the initial idea for this paper, and we developed its conceptual contributions together, each drawing on our respective area of expertise. We both wrote, edited, and created visuals for the article, with Joanna being lead author. I am happy for Joanna to include this paper as part of her DPhil thesis.

Sincerely,

A handwritten signature in black ink, appearing to read 'N. Frayne', followed by a period.

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