Beyond Speculation

A Framework for the Future of African Technology

by

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ABSTRACT

Artisanal cobalt and lithium mining in southwestern Nigeria operates under conditions Cameroonian philosopher Achille Mbembe would recognize as "necropolitical", zones where human life and ecological survival are subordinated to global capital. The financial architecture sustaining this extraction is headquartered not in Africa but in Toronto, Canada, the undisputed global hub of mining finance. This Research-Creation thesis intervenes at that geographic intersection, asking what a genuinely decolonial technological alternative would look like if designed from within the systems it seeks to challenge.

To answer that question, this thesis introduces the Decolonial Foresight Method (DFM): a three-pillar methodology that combines Africanfuturism as epistemological grounding, Local Foresight as a participatory strategy, and a Material Translation as a variable output mechanism whose form is determined by the deployment community's context. In this iteration, Material Translation takes the form of Speculative Design and immersive VR prototyping. While existing frameworks, including Escobar's autonomous design and Mohamed et al.'s sociotechnical foresight, identify the need for community-accountable technological methodologies, the DFM operationalizes this need through a structured process: expert interviews translate indigenous cultural values into engineering specifications, which are then tested through immersive digital prototyping.

The methodology produces the *Oko Ayo*, a biomimetic hexapod mining device whose spider-form draws on the Akan figure of Anansi, whose haptic telemetry reframes extraction as a somatic dialogue with the earth, and whose closed-loop mesh network ensures geological data remains the sovereign property of the local mining community. This device is materialized within an interactive Virtual Reality documentary set in a speculative reclamation zone in southwestern Nigeria.

While this specific thesis applies the DFM to spatial computing and technological hardware, the methodology's structure is inherently variable, designed to support decolonial innovation across multiple domains, including policy, governance, and institutional design.

The DFM's transferability is propositional at this stage, tested against a single cultural epistemology and a single industrial sector. It is offered as a replicable methodology demonstrating that high technology is not bound to the continuation of colonialism.

Keywords: *Decolonial Foresight Method, Africanfuturism, Diegetic Prototyping, Virtual Reality, Ethical Mining, Critical Fabulation, Local Foresight, Speculative Design, Data Sovereignty, Necropolitics.*

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1. INTRODUCTION

1.1 A RUDE AWAKENING

Marvel's Black Panther (2018) introduced Afrofuturism to mainstream audiences by depicting Wakanda, a technologically advanced African nation that subverts traditional Western narratives. The film's release marked a global milestone, with Black communities celebrating by attending screenings in traditional attire. This contributed to its billion-dollar box-office success and to its historic Best Picture nomination at the 91st Academy Awards. The achievement underscored Afrofuturism as a dynamic aesthetic and speculative movement, illustrating its capacity to envision Black futures through science and technology (Womack, 2014). As a Nigerian living in the diaspora, I initially experienced immense pride. However, this pride diminished upon returning to Lagos and witnessing persistent blackouts, revealing that even developed areas of the city lack reliable electricity. Subsequently, a visit to Dubai, a city similarly reliant on oil exports, intensified my dissatisfaction and prompted reflection on Lagos's untapped potential given Nigeria’s substantial resource wealth.

The speculative visions depicted in Black Panther underscore the persistent reality that Africa lags significantly in technological innovation. According to the UNESCO Institute for Statistics (2025), the continent contributes less than 1% of global research and development (R&D) expenditure. Furthermore, only 38% of Africa's population had access to the internet in 2024, compared with a global average of 68% (ITU, 2025). Nigeria, the continent's most populous nation, exemplifies this disparity, with R&D spending at only 0.28% of GDP in 2019 (World Bank, 2025) and ongoing challenges in digital infrastructure and access (ITU, 2025). Although speculative fiction does not directly address immediate challenges, the contrast between Black Panther’s portrayal and Africa’s current realities is pronounced. As a documentary filmmaker, I was motivated to investigate how speculative African literature could inform technological advancement on the continent.

1.2 AFROFUTURISM V. AFRICANFUTURISM

The Afrofuturism movement has historically served as a vital tool for examining societal problems, offering an escape from real-world troubles, and inspiring pride by imagining possible futures through a Black cultural lens (Womack, 2014). It emerged to describe "speculative fiction that treats African-American themes and addresses African-American concerns in the context of twentieth-century technoculture" (Dery, 1994). According to Ytasha Womack (2013), Afrofuturism is the ideal starting point for exploring various forms of African speculative media. It has served as an aesthetic and political expression of Black culture that investigates the intersection of African diaspora culture with science and

technology, often envisioning Black futures rooted in Afro-diasporic experiences (Womack, 2013). Themes such as alienation, the sensation of being "Other," and the subversion of science fiction tropes to complicate issues of racial difference are central to its diasporic roots (Dery, 1994). However, Afrofuturism, by its very definition, often operates through a Western-centric lens, reimagining Black futures within a context shaped by Western narratives and experiences (Okorafor, 2019).

This distinction highlights the importance of *Africanfuturism*, a more recent term coined by Nigerian-American science fiction author Nnedi Okorafor to specifically describe a sub-category of science fiction "rooted first and foremost in Africa" (Okorafor, 2019). Okorafor emphasizes that Africanfuturism does not privilege or center the West; its default setting is firmly established in African culture, history, and mythology (Okorafor, 2019). Mohale Mashigo further articulates this need, arguing that Africans living in Africa require a distinct speculative project that envisions Africa's future "postcolonialism," drawing from local folklore and urban legends, and allowing African languages and cultures to actively collaborate with technology to express internal realities (Mashigo, 2021). This is not just a semantic difference but a reclaiming of narrative power and a declaration of the right to define one's own future imaginaries from within, rather than having them imposed or interpreted from outside (Okorafor, 2019). It demonstrates that while Afrofuturism created a foundational representational space for the Black diaspora, its influence on the African continent itself seems limited, thus necessitating the development of a distinct creative framework, Africanfuturism.

Table 1: Key Distinctions: Afrofuturism vs. Africanfuturism

Category	Afrofuturism	Africanfuturism
Definition	Speculative fiction addressing African-American themes, technoculture, and concerns of the African diaspora.	Sub-category of science fiction rooted specifically in African culture, history, mythology, and point of view.
Originator	Mark Dery (coined term).	Nnedi Okorafor (coined term).

Primary Focus	African American/Diasporic experiences are often viewed through a Western lens.	Continental African realities do not privilege or center the West.
Relationship to Western Hegemony	Reimagines Black futures and addresses alienation and "Otherness" in a context often shaped by Western narratives.	Imagines postcolonial futures unique to African countries, leveraging local languages/cultures with technology; actively non-Western centric.
Key Themes	Slavery/diaspora as alien invasion; reclaiming history of the future; feminism; the grotesque.	Optimistic outlook; interest in technology; often involves space travel; integration of actual African spiritualities/cosmologies.
Examples/Metaphors	Wakanda builds an outpost in Oakland, CA, USA.	Wakanda builds an outpost in a neighbouring African country.

A key distinction between African literature and Western-centric fiction is the conceptualization of time. Scholars argue that African fiction's non-linear temporality leads Africanfuturism to focus on the present (Hanchey, 2024). This distinction is central to the project, as it suggests that African and Western speculative fiction fulfill different functions, and the assumption that speculation must be oriented toward a linear future may not apply to Africanfuturism. This concept will be examined in greater detail. The discovery of Africanfuturism has provided a robust foundation for investigating whether speculative literature, beyond generating imaginative ideas, can also address Africa's immediate socioeconomic challenges and help bridge the continent's technological gap.

1.3 ETHICAL MINING AND THE REAL-LIFE VIBRANIUM

Africa is a continent of immense natural wealth, presenting a unique opportunity for both technological advancement and economic diversification. At the center of this potential is cobalt, a crucial mineral essential for the rechargeable lithium-ion batteries powering today's electronics and electric vehicles. This soaring global demand positions cobalt as a real-world "Vibranium" (a fictional, powerful mineral from Black Panther's Wakanda), offering significant economic leverage if extracted responsibly. Every framework proposed for future technological innovation requires a case study to test its efficacy; therefore, this project focuses on a speculative solution for artisanal cobalt and lithium mining in Nigeria.

The urgency of this intervention stems from the dark reality of current extraction methods. A significant portion of the world's cobalt supply is sourced from informal, small-scale artisanal mining (ASM). In extraction zones like the Democratic Republic of Congo (DRC), this sector is fraught with severe human rights risks, including child labour, hazardous working conditions, and environmental degradation (Lawson, 2021; Eskelinen et al., 2024). Operating without economic alternatives, artisanal miners often resort to dangerous practices that lead to habitat destruction and water pollution. These conditions reflect what Cameroonian philosopher Achille Mbembe defines as "necropolitics"—the subjugation of life to the power of death (2003). In his framework, these unregulated mining pits function as "death-worlds," distinct zones where human life is violently subordinated to the sovereignty of resource extraction and global market demands.

Crucially, this necropolitical redesign is deeply influenced by the macroeconomic systems that control global capital. While the physical burden of mining falls heavily on the Global South, the demand and financial orchestration are driven primarily by the Global North, particularly Canada. Toronto serves as the undisputed financial hub of the global extractive industry (Holterman et al., 2020), hosting the vast majority of the world's mining and exploration companies on the Toronto Stock Exchange (TSX). Former Member of Parliament Charlie Angus argues that this structure of financial dominance was forged in the early twentieth century during the 1903 silver rush in Cobalt, Ontario. In *Cobalt: Cradle of the Demon Metals, Birth of a Mining Superpower* (2022), Angus suggests that this region gave rise to the aggressive regulatory and speculative frameworks that shaped modern Canadian mining capital. Today, the legal precedents perfected in Cobalt, Ontario, are exported globally, providing an economic haven for extractive industries operating across Africa (Deneault and Sacher, 2012). Thus, developing a decolonial framework for ethical cobalt mining from within Toronto places this research at the exact geographic intersection of Western capital and diasporic intervention, compelling the systems that support extractive violence to confront an ethical alternative.

In addition, it is important to note that Toronto does not operate in isolation. Nick Bernards, a political economist at the University of Glasgow whose research examines the financialization of global commodity markets, argues in his article ‘Child Labour, Cobalt and the London Metal Exchange,’ published in Economy, that the LME is the institution through which cobalt has come to be traded as a speculative asset, in a process that divorces value from the underlying material form (2021). This means that the monetary value extracted from Nigerian and Congolese mining pits is determined on trading floors in the City of London by actors with no proximity to the extraction itself (Bernards, 2021). The persistence of

controversies around child labour and cobalt, Bernards contends, highlights how fraught this process of abstraction is, a dynamic that structurally disadvantages the producing communities of the Global South (Bernards, 2021). The extractive system is therefore not centred in a single city but distributed across a transatlantic financial architecture in which Toronto originates the capital, London prices the commodity, and the Global South bears the body.

Nigeria offers a rich, proactive context for this intervention. While the nation's mining industry was historically overshadowed by a focus on crude oil, leading to a sharp decline in its GDP contribution (PwC, 2023), Nigeria possesses an estimated 44 minerals valued at $700 billion, including some of Africa's largest cobalt reserves (LSE Business Review, 2025; Adeyemi & Oladipo, 2024). To avoid the human rights and environmental pitfalls seen in the DRC, the Nigerian government is actively working to formalize ASM (Adeyemi & Oladipo, 2024). However, as Kunal Sen notes in *Mining For Change*, effectively managing natural resource booms depends largely on successful structural transformation (Page & Tarp, 2020). Rather than focusing strictly on government policy, this project emphasizes the involvement of local stakeholders to cultivate grassroots, Africanfuturist solutions.

My focus on this sector is a direct continuation of my ongoing practice in visual storytelling. Over seven years as a director and producer, particularly in documentary work such as *Boys on the Brink* (2022) and *Beyond Tarkwa Bay* (2026), my creative focus has consistently centred on the lived realities, vulnerabilities, and survival mechanisms of young African men, the primary occupants of artisanal pits. Transitioning my practice from traditional filmmaking to immersive VR enables a critical shift: moving from simply documenting these precarious conditions to actively redesigning the technological systems that govern them. Grounding this macroeconomic critique in tangible reality, my research maintains a direct line of communication with an individual currently involved in lithium mining in southwestern Nigeria, utilizing their insights and firsthand photographs as the raw material for this speculative design.

Despite Africa's abundant natural resources and the growing influence of decolonial Africanfuturism, limited investment in research and a persistent digital divide continue to hinder technological advancement (ITU, 2025). If African speculative fiction is to generate transformative ideas that inspire tangible innovations and foster technological independence, it must actively address the continent's urgent material needs. The Nigerian cobalt and lithium sector, approached through Africanfuturist principles and local foresight, offers more than a case study. It offers a starting point for engineering a genuinely ethical technological future. This potential directly informs the central aims of this thesis.

1.4 THIS PROJECT

Having established the necropolitical reality of the artisanal mining sector and my ongoing practice in visual storytelling, this project asks a critical follow-up question: what comes *after* documentation? While traditional vérité documentary effectively exposes vulnerabilities and raises global awareness, awareness alone has not been enough to disrupt the systems driving extraction. While current academic discourse has introduced "decolonial foresight" as a necessary theoretical tool to imagine equitable futures (Mohamed et al., 2020), these frameworks frequently remain confined to sociotechnical critique. This thesis takes that critical next step. It shifts from theoretical observation to applied redesign, operationalizing decolonial foresight to ask not just what is happening but to actively build what could be.

To enable this transition, an interactive output was essential. One that immerses viewers within a speculative environment rather than solely feeding them information. Consequently, this project marks the integration of Virtual Reality (VR) into my practice, acknowledging that conventional 2D documentary approaches cannot adequately foster the participatory, spatial agency required to address the thesis's central questions. However, while documentary filmmaking is inherently rooted in reality, translating the conceptual narratives of Africanfuturism into practical hardware innovation requires a rigorous grounding. Without such grounding, the radical act of speculation risks devolving into mere fantasy. Local Foresight practices address this exact challenge. Using this, the project shifts the paradigm: marginalized community stakeholders and subject experts are no longer the subjects of a documentary lens, but are elevated to active co-authors of their own future scenarios.

Synthesizing these elements, this project introduces the **Decolonial Foresight Method (DFM)**. This impact-focused and scalable research methodology explores how Africanfuturist imaginaries can be explicitly operationalized to bridge the technological divide between Africa and the West, which is one expression of a broader structural condition the DFM is equipped to address. The core proposition of this thesis is that truly sustainable, sovereign infrastructure cannot be exported from Western capital; rather, it demands the direct co-creation of technological innovation by the communities most heavily affected. By merging Indigenous epistemologies, participatory foresight methods, and spatial computing, the DFM moves beyond critique to produce practical, interactive blueprints for decolonial engineering.

The DFM is characterized by this three-way synthesis:

Africanfuturism (The Epistemology): Offers the theoretical foundation, ensuring that future technological systems are grounded in continental philosophies, aesthetics, and cultural narratives.

Local Foresight (The Strategy): Focuses on participatory, bottom-up knowledge, shifting the authorship of future development to local stakeholders, and ensuring that the resulting technology directly addresses the community's economic and ecological realities.

Speculative Design (The Material Translation): Uses spatial computing and rapid 3D prototyping to turn abstract socio-economic ideas into tangible, testable, and experiential forms.

To rigorously test the effectiveness of the DFM, this research applies the framework to a specific, urgent case study: the artisanal cobalt and lithium mining sector in southwestern Nigeria. This methodological approach results in an interactive VR documentary designed to confront the severe human rights, environmental, and economic challenges faced by African miners. The digital artifacts produced by this research are more than just illustrative visual aids; they are performative acts of decolonial authorship. The VR experience physically embodies alternative technological futures, turning speculative ideas into tangible and testable realities.

1.5 SCOPE AND LIMITATIONS

I have approached this project from the perspective of a documentarian entering an unfamiliar environment, intent on exploring and developing a foundational concept. This orientation has shaped my engagement with world-building in VR, using the medium to extend documentary practice from observation to immersive experience. Whereas traditional film confines the audience to a fixed frame, VR enables participants to navigate and interact directly with the speculative environment, fostering deeper engagement with the project's subject matter and context. As I continue to develop proficiency in Unity, the project is intentionally scoped as a foundational iteration to produce a simplified minimum viable product (MVP) that demonstrates the thesis framework within current technical constraints.

Centring the research on Nigeria's cobalt mining industry enables a detailed case study of how Africanfuturist principles can be applied to real economic sectors confronting developmental and ethical challenges. My methodology employs a mixed-methods research-creation approach that includes cultural and textual analysis, qualitative interviews, principles from local foresight, and speculative design techniques.

However, it is imperative to acknowledge that the resulting speculative technology does not exist in a vacuum; its feasibility relies on specific sociotechnical, legal, and economic shifts that define the boundaries of this project. Firstly, the project navigates a critical "blind spot" regarding the political economy of ownership. Under the Nigerian Minerals and Mining Act of 2007 (Federal Republic of Nigeria), the ownership and control of all mineral resources are vested exclusively in the Federal Government. Currently, local communities often bear the environmental cost of extraction without legal ownership of the resources beneath their feet. Therefore, the speculative device presented in the VR environment operates as a Design Fiction regarding governance as much as technology. It assumes a speculative legislative change, a future scenario where the Mining Act has been amended to support the existence of a community-run renewable grid, implying a post-legislative reality where local stakeholders have the sovereignty to govern their own "real-life Vibranium."

Moreover, this thesis does not seek to develop commercially deployable mining technology or influence government regulations. Though policy and state intervention are crucial in African industrial growth, this project deliberately remains outside those institutional frameworks. Following design justice principles (Costanza-Chock, 2020), it opposes top-down solutions and instead emphasizes communities' ability to envision and shape their own technological futures. Therefore, the speculative device in the VR environment is not a product proposal but an invitation to reconsider ownership, value, labour, and innovation within an African speculative framework.

More precisely, the research methodology proposed in this thesis is designed as an intervention into the operational logic of extractive capitalism itself. The transatlantic financial architecture sustaining artisanal mining is a design system, one that encodes inequality into the infrastructure of extraction. This thesis proposes that other design systems can counter design systems: that by encoding community benefit as a structural precondition of the technology rather than a discretionary output of corporate goodwill, the DFM goes beyond critiquing extractive capitalism to propose an engineering alternative to one of its operational mechanisms.

As this project constitutes a creative exploration rather than a large-scale qualitative survey, the interview sample size is deliberately limited. While time and budget constraints are factors, the primary rationale is to prioritize insights from creative technologists, foresight practitioners, and local experts whose lived and professional knowledge directly inform the design of the speculative device. This approach privileges depth over breadth, consistent with research-creation’s emphasis on situated knowledge rather than extensive data

collection. The insights obtained are intended to provide critical input for the development of the innovative prototype. Furthermore, the research foregrounds contributions from BIPOC scholars to ensure that local perspectives are integrated into the project's theoretical framework.

It is necessary to clarify that this thesis does not seek to critique or revise Africanfuturism as a literary or aesthetic movement. While Africanfuturism primarily flourishes in literature, visual arts, and storytelling, this thesis positions it as a design and innovation framework to inform real-world initiatives. This perspective aligns with calls for Africans to innovate beyond inherited models, highlighting the importance of transforming speculative imaginaries into pathways for new development paradigms (Dotse, 2016). Accordingly, this work contributes to a practice-oriented branch of Africanfuturism that addresses the continent's immediate needs. The objective is not to redefine Africanfuturism but to broaden its application by integrating community-centred design practices that translate cultural imagination into practical technological solutions.

Finally, the ambition of this project is not limited to the design of an ethical mining device or the production of a VR documentary. It is to demonstrate that the mechanisms of access — who can extract value from a territory, on what terms, and with whose participation — can be encoded into the operational logic of technology itself. This makes community sovereignty a technical precondition rather than a political aspiration. Therefore, the DFM's most significant proposition is not just that technology can be designed otherwise but that the architecture of extraction can be.

2. LITERATURE REVIEW

2.1 AFRICANFUTURISM: A DECOLONIAL REORIENTATION

Building on the distinction between Afrofuturism and Africanfuturism established in Section 1.2, this project adopts Nnedi Okorafor's framework of Africanfuturism as a mechanism for epistemological reorientation. While the earlier definition highlighted the divergence between diaspora-centric and continent-centric narratives, this section examines how that shift fundamentally alters the design of speculative technology.

The history of African literature begins with oral tradition, mythology, and folklore. These oral traditions have long been the primary vehicles for enculturation and entertainment in African societies, with storytelling playing a crucial role in passing down customs from one generation to the next. Traditionally called "Tales by Moonlight," these campfire stories were meant to prepare young people for life, each with a moral lesson. Many early African writers found these fables a rich source of inspiration, translating their structures into literary form. Researchers in language and literature, Joshua Usman and Marius Crous, cite the works of successful early African writers such as Daniel O. Fagunwa of Nigeria, Violet Dube in Zulu, and S.E.K. Mghayi in Xhosa as examples of literature inspired by traditional oral storytelling. A strong example here is Daniel O. Fagunwa's *Ògbójú Ọdẹ nínú Igbó Irúnmalẹ̀ (The Forest of a Thousand Daemons, 1938)*, which is often considered the first full-length novel in Yoruba. When adapted into written form, oral storytelling traditions mirror their oral origins—episodic, cyclical, and laden with proverbs, songs, and moral lessons—demonstrating how African literature emerges directly from indigenous forms of narration (Usman & Crous 2018). They emphasize that understanding African speculative fiction today requires recognizing its historical context, which often blends past fantasies with contemporary realities (Usman & Crous, 2018). Those early writers crafted stories based on their experiences and realities on the continent, using their histories, cultures, and environments as a backdrop to create narratives accessible to their communities. Until recently, the same couldn't be said of modern African speculative literature, which, for the most part, has been viewed and labelled from the outside.

Whilst the contributions of Octavia E. Butler, Samuel R. Delany, and Ytasha L. Womack, along with other Afrofuturists, to African speculative literature cannot be downplayed, Afrofuturism's diasporic focus introduces limits when applied to the African continent itself. Mark Derry (1994), the person who coined the term Afrofuturism, describes the movement as speculative fiction that explores African–American themes and concerns within the context of twentieth-century technoculture. He expands on the fact that its focus is on

African–American signification that appropriates images of technology and a prosthetically enhanced future (Derry, 1994). Thus, even with the best intentions to represent and empower Black people worldwide, writer and academic Alondra Nelson rightly points out that this Western-centric view of African fiction often ignores the specific needs and realities of the African continent (Nelson, 2002). South African author Mohale Mashigo (2018) complements this, describing Afrofuturism as inadequate for Africans living in Africa, noting that its imaginative references and cultural grounding are mostly Western-centred.

It is within this context that Nnedi Okorafor introduced the term Africanfuturism, defining it as science fiction “rooted first and foremost in Africa” (Okorafor, 2019). Unlike Afrofuturism, Africanfuturism does not privilege the West or the diasporic experience as its point of departure; its default setting is African culture, languages, histories, and mythologies. Mashigo (2021) strengthens this position by calling for speculative projects that envision postcolonial African futures grounded in folklore, urban legends, and indigenous epistemologies. She frames Africanfuturism as a necessary decolonial practice: one that restores imaginative agency to Africans while resisting linear, Western notions of technological progress. In this way, Africanfuturism not only resists hegemonic perspectives but also opens a space where more practical speculative design practices can align with local realities.

The use of visual and immersive media to expose the supply chains of extractive violence finds a vital contemporary precedent in the practice of Congolese-Canadian artist Moridja Kitenge Banza.

Fig. 1. Moridja Kitenge Banza, *Chiromancie #14 n°1*, 2023, acrylic on canvas, 152.4 x 106.7 cm. Private Collection. Image courtesy of the artist and Galerie Hugues Charbonneau, Montreal.

Operating from within the Canadian diaspora, Banza's multidisciplinary work frequently subverts hegemonic codes to critique the historical and ongoing plunder of African resources, particularly within the Democratic Republic of Congo. In his *Chiromancie* series, Banza merges the divinatory lines of palmistry with the violent cartography of colonial borders, drawing direct parallels between historical conquest and modern extraction in regions like the DRC and Québec (PHI Foundation, 2023). Where Banza utilizes these analog material cultures and spatial disruptions to map the historical trauma of colonial extraction, this thesis extends that trajectory into the digital and speculative realm. Through this, we both aim to compel Western institutional spaces to confront the global extraction that sustains them physically.

The theoretical shift from diasporic representation to continental infrastructural reality is powerfully visualized in the speculative design practice of Olalekan Jeyifous. The Brooklyn-based Nigerian artist's project is a series of digital illustrations that reimagines informal settlements in Lagos, Nigeria, as multi-story architectural marvels. For CNN Style, Nosmot Gbadamosi describes his work as a recreation of Lagos in 2050, in which tall tin shacks overshadow the city's luxury real estate (Gbadamosi 2016). This recontextualizes the "shanty," normally a symbol of poverty and instability, into a resilient and innovative urban design. By using 3D visuals, "which he then later rendered into digital photographs" (Gbadamosi, 2016), Jeyifous creates a speculative future that is optimistic, resourceful, and deeply rooted in the realities of African urbanism. His projects present a compelling case that African urbanism is a source of architectural and social ingenuity.

Fig. 2. *"Shanty Megastructures" by Olalekan Jeyifous (Exhibited 2021–2024).*

However, a critical distinction lies in the intended utility of the speculation. Jeyifous explicitly frames his work as an artistic provocation rather than a "real-world solution," noting that the structures are not designed to withstand engineering scrutiny. His work primarily aims to challenge existing narratives and broaden the continent's visual imagination. By extrapolating local materials such as tin and recycled scrap to futuristic scales, Jeyifous perfectly operationalizes Mashigo's call for futures grounded in indigenous epistemologies. His work demonstrates that Africanfuturism is more than a narrative genre and could inspire spatial and architectural strategies.

While Jeyifous frames his work as an artistic provocation, this thesis adopts his aesthetic strategy of centring local resourcefulness but applies it toward functional plausibility in industrial design. Although it could be argued that using speculative design as a tool for a contemporary solution conflicts with its inherent purpose (Dunne & Raby, 2013), similarly, one could also contend that applying the linear temporality suggested in Western speculative fiction clashes with and limits the cyclical temporality characteristic of Africanfuturism.

2.2 AFRICANFUTURISM, TIME & LAND STEWARDSHIP

Another key feature of Africanfuturism, most relevant to this project, is its approach to time. British science fiction writer Jenna Hanchey (2024) argues that African fiction often operates through a non-linear temporality, emphasizing the present rather than projecting into distant futures. This contrasts with Western science fiction's focus on linear progress and technological utopias or dystopias.

Africanfuturist narratives frequently collapse the categories of past, present, and future, drawing upon myth, memory, and spirituality to reimagine technological possibilities as imminent rather than deferred. This mode of temporality is grounded in longstanding African philosophies. Kenyan philosopher and writer John Mbiti famously argued that African concepts of time emphasize an expansive past and present, with the distant future occupying little conceptual space because it has not yet been experienced (Paratt, 1977). His theorization emerged from his deep study of East African cultural and religious practices. In *African Religions and Philosophy*, Mbiti describes East African concepts of time as having two dimensions, unlike the Western three-part past/present/future, which he called "*Sasa and Zamani*" (Mbiti, 1989). He describes Sasa as the domain of immediate time, events that are happening, just happened, or will happen soon. Zamani is the limitless reservoir of deep time, encompassing myth, ancestry, and cosmology. Hanchey (2024) details:

> *Sasa is the time of immediate concern, incorporating what is happening, what has just happened, and occupies your mind, and what you know is about to happen. The*

> *“you” here is expansive, bringing together individual experience, family and community experience, and that which is passed down through story. Notably, Sasa can only be narrated in and through experience, whether that is of a single person or a community. Zamani, on the other hand, is the deep time that extends outside of the bounds of experiential narration. Mbiti says that the Sasa “feeds or disappears into Zamani.”[Mbiti, 1989]. Zamani is what passes beyond individual or collective consciousness or memory.*

According to Mbiti, these concepts emerged from observing oral storytelling, cyclical rituals, and communal memory in East African communities, and how they shared history and experiences. While John Mbiti’s categories of Sasa and Zamani were developed in East African contexts, their underlying logic resonates more broadly with other African philosophies of time. In Nigerian Yoruba cosmology, for example, the worlds of Aiye (the physical) and Orun (the spiritual) are in constant cyclical exchange, creating a temporality in which the living, ancestors, and the unborn coexist across porous boundaries (Abimbola, 1976). In addition, Akan philosophy in Ghana similarly frames time through reincarnation and continuity with the ancestors, emphasizing a cyclical rather than linear model of development (Gyekye, 1995).

This cyclical view of time has informed African literary texts that depict interactions between ancestral pasts and contemporary realities. In Ben Okri’s *The Famished Road* (1991), the novel’s central figure, Azaro, is an *abiku* or “spirit child” who inhabits a liminal space between the human and spirit worlds. His perpetual cycle of death and rebirth embodies a worldview in which time is neither linear nor progressive but cyclical and recursive (Okri, 1991). His work implicitly aligns with the Africanfuturist impulse to reimagine futures from within African epistemologies rather than through externally imposed speculative frameworks. Another Africanfuturistic text that demonstrates cyclical temporality is Nnedi Okorafor’s *Who Fears Death* (2010). In this novel, Okorafor situated her speculative world in a post-apocalyptic Sudan. The protagonist, Onyesonwu (whose name means “Who fears death”), is both a child of violence and an inheritor of ancestral power. Her journey is structured around cycles of rebirth, initiation, and transformation that echo indigenous African spiritual frameworks of time. Similar to *The Famished Road*, the future isn't seen as a distant horizon but as something written in the present.

In immersive media, this theoretical collapse of the past, present, and future has been actively used as a tool in decolonial narratives. Nadine Valcin’s VR experience, *Our Home and Haunted Land* (2021), enacts the *Zamani/Sasa* dynamic by rendering colonial histories

embedded in Toronto spaces. Using "research-creation and decolonial methodologies" and 3D photogrammetry to render spaces as "point clouds" (Valcin, 2021), Valcin's work immerses the participant and makes visible the "hidden histories that haunt us", demonstrating that the past (Zamani) is never banished but remains an active force in the present (Sasa).

Fig. 3. *Image of The Gladstone Hotel in "Our Home and Haunted Land" by Nadine Valcin (2021).*

Hanchey asserts that "by engaging time in ways that break the linear trajectories that development depends upon, African temporalities slip between the cracks of coloniality to unlock decolonial potential in the present" (Hanchey, 2024). I agree with this, but only within the realm of literary and visual expressions, where it can promote cultural preservation and speculative creativity. In practical terms of governance, economic planning, and technology policy, societies still need to operate within standardized timeframes to make measurable progress and participate in global conversations. Thus, while African temporalities such as Sasa and Zamani inspire powerful alternative imaginaries that resist colonial logics, their primary value lies in shaping narrative, aesthetic, and speculative practices that reframe how we think about futures. In fact, it is vital, according to science fiction writer Jonathan Dotse in *African Futures : Thinking about the Future through Word and Image* (2016), that our imaginings of the future are non-linear "to truly capture the exponentially diverse array of possible futures ahead of us at any given point in time" (Heidenreich-Seleme & O'Toole, 2016).

Similarly, Anishinaabe director Lisa Jackson's VR experience *Biidaaban: First Light* (2018) immerses the user in a speculative Toronto reclaimed by the natural world and Indigenous languages. It offers a profound model for Indigenous futurism by embedding the Anishinaabemowin and Wendat languages directly into the cityscape. The project

undertakes linguistic and spatial decolonization, visualizing a renewed, reciprocal relationship between Indigenous peoples and the land.

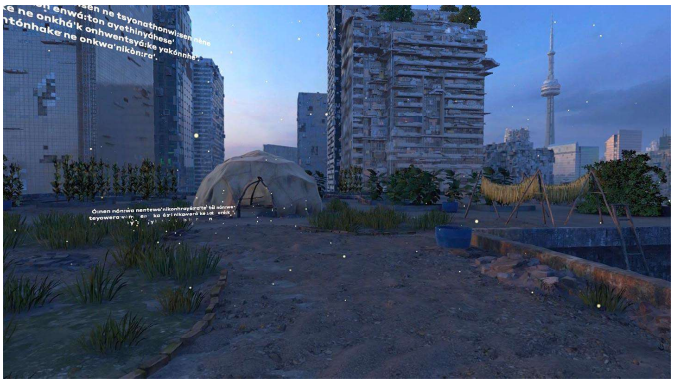

Fig. 4. *Biidaaban: First Light by Lisa Jackson (2018). Photograph copyright National Film Board of Canada.*

This experience was instrumental in shaping the methodological approach of my own thesis. Travelling through a Toronto that was both familiar and radically changed showed that land is not just a static background but a container of memory and possibility. Jackson's work serves as a methodological analogue for this thesis: it demonstrates that VR is not merely a simulation tool but a "lived environment" capable of manifesting cyclical time and a reciprocal relationship with the land. While Valcin uses immersive media for digital archaeology (critiquing the present through the past), Jackson uses it to visualize Indigenous futures. "Beyond Speculation" synthesizes these approaches by integrating the ancestral concept of land stewardship into the structural design of future mining technologies.

The greatest benefit of Africanfuturism is its return to the foundational framework from which African speculative literature originated. Scenarios of "what 2030 or 2050 might look like" risk abstracting Africa's urgent technological, socio-economic, and ethical challenges into distant horizons. This project will acknowledge the urgency of African speculative literature and promote cyclical temporality in its design, while remaining mindful of the necessity of a universal timespace. This context ensures that the project's creative output—the speculative device—serves as both a critique of current exploitative mining and a proposal for renewable, community-centred technological futures in Nigeria.

2.3 AFRICANFUTURISM AND TECHNOLOGY

Contemporary Africanfuturist literature offers a diverse set of imaginative blueprints for thinking about African technology. Africanfuturism reimagines technology not as an external imposition, but as deeply entangled with African epistemologies. Okorafor's *Noor* (2021), set in northern Nigeria, depicts a near-future world of cybernetics, renewable energy, and corporate exploitation. Its protagonist, *AO*, embodies both technological augmentation and

resistance to multinational domination, making the novel a critical reference for ethical debates around bodily enhancement and resource economies (Okorafor, 2021). Similarly, British-Nigerian author Tade Thompson's *Rosewater* (2016) offers a parallel vision of near-future Nigeria under alien influence, where biopunk and networked systems reshape human life. The novel foregrounds questions of sovereignty, surveillance, and bodily autonomy, issues resonant with the global mining industry's relationship to African resources. Taken together, Okorafor and Thompson offer speculative models for both the risks and opportunities of technological development rooted in African contexts. These works exemplify how Africanfuturism reimagines science and technology as entangled with African epistemologies rather than external impositions.

Similarly, Africanfuturism has increasingly been mobilized to visualize technologically accelerated African cities. A notable example is the Disney+ animated series *Iwájú* (2024), which is set in a speculative future Lagos characterized by stark vertical stratification. Advanced technologies such as robotics, aerial transport, and automated systems are concentrated among elite island communities, while mainland populations contend with infrastructural neglect and scarcity. As a "future text" in Nelson's sense, *Iwájú* performs important cultural work by rendering African technological futures visible within global media circuits (2002).

To fully ground these speculative models in indigenous thought, it is necessary to look beyond fiction to the work of Zimbabwean Science, Technology, and Society (STS) scholar Clapperton Chakanetsa Mavhunga. In *What Do Science, Technology, and Innovation Mean from Africa?* (2017), Mavhunga challenges the reduction of technology to mere hardware imported from the West. He instead conceptualizes technology as "*mazano"*, the strategic and creative responses that people develop to ensure survival and adapt to their environment. This theoretical reframing of technology as *mazano* is brilliantly realized in Patricia Mwenda's speculative design work.

Fig. 5. *Image of Mwenda's Tulia Band from "She is not alone!" (2023).*

Mwenda's project demonstrates the socially engaged power of Africanfuturist speculative design. Her work conceptualizes "speculative wearable technology" for Kenyan survivors of domestic abuse. Her wearables devices, such as the *Moyo Monitor* and *Tulia Band*, functioned as "diegetic prototypes" rooted in Kenyan cultural aesthetics and Africanfuturist sensibilities (Mwenda, 2023). Unlike speculative projects that remain purely conceptual, Mwenda's devices operate as activist propositions. They imagine technological interventions able to address immediate psychological, emotional, and community-level needs. In doing so, her work highlights how Africanfuturist design can be mobilized as an activist proposition and conduit for care, empowerment, and healing.

Both our projects utilize the Africanfuturist framework to reclaim agency, hers over the body, and mine over the land and resources, demonstrating the versatility of the genre in addressing the full spectrum of the postcolonial condition. Mavhunga provides a critical theoretical basis for this by framing technology as an indigenous practice of "creative resilience": the proposed speculative device is not a foreign intervention but a continuation of African mazano, a strategic response to the specific environmental and ethical challenges of mining in Africa.

Dotse posits that these speculative imaginaries, even if not entirely scientifically accurate, can serve as lighthouses that help steer African futures away from undesirable scenarios toward our preferred ones (Heidenreich-Seleme & O'Toole, 2016). He emphasizes the importance of Africans playing a larger role in developing the technologies we use, noting that Africa is uniquely positioned to lead new development models that avoid many of the social and environmental issues caused by advanced economies (Heidenreich-Seleme & O'Toole, 2016). This highlights the creative framework of this project, in which field experts can collaborate to guide the development of technology to address specific social, ethical, and environmental issues in Africa.

2.4 FROM LITERATURE TO DESIGN FICTION

The transition from speculative literature to speculative design is methodologically grounded in Anthony Dunne and Fiona Raby's *Speculative Everything* (2013). They argue that design can move beyond problem-solving to provoke critical reflection, acting as a medium for "social dreaming" and collective imagination (Dunne & Raby, 2013). For them, speculative design is not about prediction but about using design fictions to explore possible worlds, provoke debate, and make abstract ideas tangible. Whilst this framework resonates with some aspects of Africanfuturism that resist linear predictions, design researcher James Auger extends this perspective by proposing that "speculative design serves two distinct

purposes: first, to enable us to think about the future; second, to critique current practice" (Auger, 2013). His dual emphasis aligns directly with Africanfuturism's common method: envisioning alternative futures while simultaneously interrogating current structures of power and technology. In *Rosewater*, Thompson places alien biotechnologies in Nigeria to explore who controls innovation and at what expense, using the alien dome as a symbol of surveillance, exploitation, and technological colonialism. Similarly, *Noor* critiques corporate monopolies, environmental instability, and extractive capitalism. Africanfuturist texts tend to focus on integrating technology within African cultural, political, and ecological contexts. However, I argue that Africanfuturism, as a movement, can be enriched by a framework that fosters technological innovation while addressing urgent challenges in Africa through a more practical form of social dreaming.

This argument is partly motivated by a comparison with the history of Western science fiction's role in inspiring real-world technological development. "Communicators" from the science fiction space opera *Star Trek* (1966) prefigured the mobile phone, with Martin Cooper, the inventor of the first handheld cellular device, citing the series as an inspiration (Cooper, 2021). Similarly, Arthur C. Clarke's short story *The Sentinel* (1951), which served as the basis for the classic film *2001: A Space Odyssey* (1968), introduced the concept of communication satellites. Today, satellites form the backbone of global telecommunications. In addition, Stanley Kubrick's HAL 9000 from the same film, an artificial intelligence system, anticipates today's conversational AI and smart assistants such as Siri and Alexa. It may be an unfair comparison and a steep climb, but every journey starts with a first step. A good first step is to create a framework that integrates Africanfuturism to advance speculative imaginations that could lead to impactful real-world technologies.

2.5 LOCAL FORESIGHT

To move "Beyond Speculation," the creative output of this thesis must be grounded in viable and community-driven action. This transition requires distinguishing futurism, an act of imagination, from foresight, an act of strategy. As Richard Slaughter notes, foresight goes beyond image-making to create 'structurally critical views' that drive action (1995). In this framework, Africanfuturism supplies the vision, while foresight provides the viability.

Foresight, according to the United Nations Development Program (UNDP), is defined as "a systematic, participatory, future-intelligence-gathering and medium-to-long-term vision-building process aimed at enabling present-day decisions and mobilizing joint action" (2018). Hence, it provides the methodological grounding for this transition. In this project, Foresight is used to translate the speculative imaginaries of Africanfuturism into a framework that challenges existing assumptions and guides collective action toward a preferred future.

For this reason, it is essential to employ Local Foresight rather than conventional Strategic Foresight. Strategic Foresight is often carried out by experts or policy institutions, making it vulnerable to what the UNDP describes as the imposition of “used, ‘second-hand’ futures from highly developed countries” on marginalized regions. Local Foresight, conversely, emphasizes participatory and situated knowledge, enabling communities to “construct development narratives of their desired futures” through their own cultural contexts (UNDP, 2018). This resistance to external imposition is critical, as the extraction of future narratives often mirrors the extraction of resources. Ethiopian cognitive scientist Abeba Birhane powerfully articulates this danger in *The Algorithmic Colonization of Africa* (2020), arguing that digital systems frequently replicate colonial patterns by extracting data without consent or local benefit. Her critique of "algorithmic colonization" emphasizes the importance of a framework developed with Local Foresight, ensuring that both the data gathered and the design created remain under local control. This grounding aligns directly with the decolonial ethos of Africanfuturism, in which technological futures originate from African epistemologies rather than Western projections.

The work of Sasha Costanza-Chock, a design theorist and leading advocate for equitable technology design, also highlights the importance of community-led visioning. In *Design Justice: Community-Led Practices to Build the Worlds We Need* (2020), Costanza-Chock critiques dominant design frameworks that produce technologies for communities without allowing those communities to participate in the creation process. They argue that conventional design methods often “reproduce structural inequalities even when design intentions are benevolent” (Costanza-Chock, 2020). Instead, Costanza-Chock proposes a design justice approach in which those most impacted by a technological system play a central role in imagining, shaping, and governing it.

This critique strengthens the case for Local Foresight in African technological futures. Rather than forecasting innovation through external expertise or global tech agendas, Local Foresight aligns with Costanza-Chock’s insistence that “design is not neutral”. It must be accountable to those most impacted by the systems it shapes. Introducing African miners, local organizers, and smaller industry actors into speculative decision-making aligns with a design justice principle that “centers the voices and leadership of those who are most directly affected by design decisions.” Local Foresight, therefore, functions as a collaborative imagining of preferred futures shaped with, rather than for, affected communities (Costanza-Chock). This emphasis underpins the methodological foundation of the speculative device in this thesis, ensuring that its conceptual development foregrounds the voices of miners, local stakeholders, and Nigerian communities affected by cobalt extraction.

Additionally, futurist Marina Gorbis (2024) supports this idea, explaining how bottom-up foresight enables communities to shape technologies that reflect their real-life experiences. Gorbis argues that such localized practices foster self-determination and reduce the dependency on external models ill-suited to the realities of the “users” they claim to support. When combined, Gorbis’ participatory foresight, Africanfuturism’s epistemic grounding, and Costanza-Chock’s critique of extractive design processes shape a cohesive methodological imperative: African technological futures must be imagined and built with, not for, African communities.

Therefore, the proposed speculative framework in this thesis relies on Local Foresight as a process of decolonial authorship. Historically, the technological trajectory of the African continent has been authored by the Global North, positioning the Global South as a passive site of extraction or a testing ground for imported solutions. This thesis explores the dismantling of that hierarchy by ensuring that the envisioned technology is both aesthetically and culturally Africanfuturist, and practically accountable to the communities whose futures it seeks to transform.

2.6 DECOLONIAL FORESIGHT

This commitment to dismantling external hierarchies is formally recognized within futures studies as decolonial foresight. Aarathi Krishnan, a researcher whose focus is on Foresight and Decolonial Tech Ethics, argues that without intentional disruption, traditional prediction models will continue to replicate a "coloniality of foresight" that centers Western technological paradigms while actively marginalizing the knowledge systems of the Global South (Krishnan, 2022). Theorists such as Shakir Mohamed et al. have advanced this concept by using decolonial theory as a form of "sociotechnical foresight" to anticipate and mitigate the harms of Western technological imposition on vulnerable populations (2020). Crucially, Mohamed et al. do not stop at critique; they explicitly call for new methodologies that enable marginalized communities to meaningfully influence technological decision-making, identifying this as an unmet need in the field. It is precisely this methodological gap that this thesis addresses.

Participatory action research traditions, from Paulo Freire's (1970) praxis methodology through to co-design frameworks developed by Björgvinsson, Ehn, and Hillgren (2010), have produced rigorous community-centred processes for generating actionable knowledge from lived experience. Nonetheless, these traditions characteristically leave the conversion from cultural epistemology to engineering specification either implicit or undocumented, treating it as an emergent property of the collaborative process rather than a structured procedural

stage. In addition, Robin Wall Kimmerer's articulation of indigenous botanical knowledge as a scientifically legitimate and generative epistemological system (2013), demonstrates that non-Western knowledge traditions can produce precise, reproducible technical specifications. This work, however, operates within scientific translation rather than design methodology, and does not address the sequential expert-consultation structure through which such specifications become hardware.

Yet while this existing discourse provides a robust sociotechnical critique, it frequently stops short of offering a tangible engineering blueprint. A comparable limitation marks Colombian-American anthropologist Arturo Escobar's autonomous design framework in *Designs for the Pluriverse* (2018). It similarly insists that indigenous epistemologies must function as constitutive design constraints and that technology must remain accountable to affected communities. Escobar's framework is a vital philosophical precedent, but it operates primarily at the level of cultural orientation rather than operational process. It identifies the values that should govern decolonial design, but it does not provide a structured mechanism for translating those values into testable hardware specifications. Additionally, design anthropologist and educator Dori Tunstall's *Decolonizing Design* (2023) makes a parallel contribution at the institutional scale, demonstrating how design schools and professional bodies must transform to reflect the lived experiences of Indigenous, Black, and People of Colour communities, but it is focused on disciplinary reform rather than project-level methodology. If marginalized communities are to secure genuine industrial and data sovereignty, this decolonial theory must be materialized into physical and spatial architecture, a step these frameworks gesture toward but don’t seem to have taken.

What all these frameworks share is a capacity to identify where decolonial technology design should arrive. What they do not provide is a sequential, documented process for getting there. It is exactly at this intersection of theory and materialization that my own practice is situated. While I am currently a Canadian Permanent Resident based in Toronto, my creative and professional foundation remains tethered to the Nigerian cultural and economic landscape. The three cities in which I have lived and studied — Lagos, London, and Toronto — are, without coincidence, three nodes of a global cobalt supply chain: the site of extraction, the seat of commodity pricing, and the center of mining finance, respectively. This vantage point, straddling the technological resources of a North American institution and the lived realities of West Africa, allows me to serve as a translational bridge. However, translating the theoretical frameworks of Local Foresight and Africanfuturism into a tangible decolonial blueprint requires an applied visual and spatial methodology. Therefore, the following chapter (Chapter 3) shifts from theoretical critique to artistic contextualization. The

shift from conventional 2D documentary observation to spatial narratives, realized through both immersive virtual reality and physical installations, offers the precise medium needed to materialize this bridge.

3. CONTEXTUAL REVIEW

3.1 SPATIAL NARRATIVE AND EMPATHY IN VR

The central challenge of this project is to operationalize Africanfuturism through an impact-driven framework, defined here as a methodological structure that translates speculative fiction from abstract critique into actionable blueprints for decolonial engineering. Throughout my career, I have found traditional documentary filmmaking a highly effective means of raising awareness, giving voice to the underserved, and highlighting overlooked crises. However, as a Digital Futures master's candidate observing the rapid evolution of spatial computing, I have realized that to move "beyond speculation" and foster tangible agency, I must enable audiences and stakeholders to explore, test, and embody these alternative realities directly.

This is why I consider a VR Interactive Documentary to be an ideal blend of form and function. Unlike conventional documentary film, which places the viewer in a passive role, VR radically redistributes agency, transforming the audience into active participants. As John Bucher argues in *Storytelling for Virtual Reality*, "the participant becomes the center of the story," a shift that fosters experiential empathy (2018). Oscar-winning documentarian Roger Ross Williams, director of *Travelling While Black*, emphasizes VR's unique immediacy: "If you're not [a black person], you get to go into a space and be part of a conversation that you probably normally would not be privy to…I think that's really powerful in the way that 2D storytelling can't provide" (McClinton, 2019).

This theoretical capacity for empathy is proven by Nonny de la Peña's *Hunger in Los Angeles* (2012), which situated users directly within a food bank crisis, transforming abstract social data into embodied witnessing.

Fig. 6. *Hunger in Los Angeles by Nonny de la Peña. Photograph copyright Emblematic Group.*

This pivotal VR documentary serves as a seminal case study for VR's capacity to generate profound "experiential empathy". As the foundational work of "immersive journalism," the project reconstructs a real-world event, a man collapsing from a diabetic seizure in a food bank queue, using actual audio recordings within a 3D environment (Bishop, 2013). As described in the IDFA entry for Hunger in L.A., it situates the user directly within this moment of social crisis, fundamentally shifting the participant's role from a passive observer of inequality to an embodied witness (de La Peña, 2012). This methodological choice validates VR as a medium capable of transforming abstract social data into ethical engagement, using emotional resonance as a catalyst for awareness.

Similarly, the volumetric VR experience *The Changing Same: An American Pilgrimage* (Stephenson et al., 2021) demonstrates critical evolution in immersive non-fiction storytelling. It transcends traditional "witnessing" by incorporating volumetric filmmaking into a magical realist framework. Created by Rada Studio and Scatter, the project uses depth-sensing cameras to capture real actors as three-dimensional holograms, placing them within a nonlinear narrative that spans 400 years of American racial history (Gayet, 2021). According to the project's press release on *XRMust*, the creators utilize "elements of time-travel" to enable participants to cycle through history before projecting them forward into "a joyful, Afrofuturist world of possibilities" (Gayet, 2021). It technically inspired the way this thesis will conduct future-themed interviews.

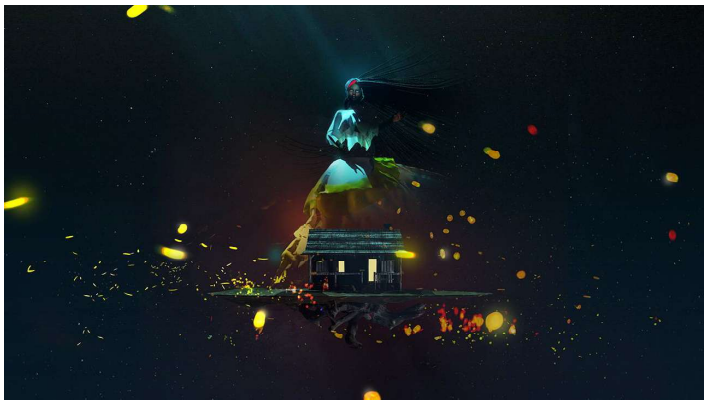

Fig. 7. Image of the volumetric characters in "The Changing Same" by Michèle Stephenson, Joe Brewster, and Yasmin Elayat (2021). Photograph copyright Rada Studio and Scatter.

Building on this, my project aims to embed real-world expertise within a rendered Africanfuturist environment. To organize this information spatially, this thesis looks to Stan Douglas's *Circa 1948* (2014) and Josh Kline's *Freedom* (2015).

Douglas's *Circa 1948*, developed in collaboration with the National Film Board of Canada, stands as a seminal work in interactive historical reconstruction. Functioning as both an augmented reality app and an immersive installation, the project utilizes high-fidelity 3D modelling and scripted spaces to resurrect two erased sites of postwar Vancouver: the predominantly Black community of Hogan's Alley and the original Hotel Vancouver (Douglas, 2014). According to the entry on MIT Docubase, Douglas crafts a non-linear, exploratory story that enables participants to physically experience these "ghost" environments by mixing elements of cinema, historical archiving, and gaming mechanics (2014).

Fig. 8. *Circa 1948 by Stan Douglas (2014). Photograph copyright National Film Board of Canada.*

What stands out to me in *Circa 1948* is how objects within the recreated environments guide the audience's experience. The project is particularly instructive for its approach to spatial storytelling, specifically how it delegates narrative authority to objects within the world. Users navigate the history by engaging with diegetic details scattered throughout the environment: a glowing door, a street sign, or a fragment of overheard conversation serves as a portal into layered historical realities. This strategy of embedding narrative triggers directly into the landscape informs the interaction design of my VR prototype. In my thesis, this methodology is adapted by placing floating screens featuring "talking heads." Much like Douglas's artifacts, these screens serve as embedded context nodes, rewarding the user's exploration with critical expert insights while maintaining immersion in the speculative terrain.

Fig. 9. *Freedom by Josh Kline. Photo by Modern Art Oxford (2015).*

The spatial arrangement of the informational screens in my project draws inspiration from the curatorial strategy employed in Josh Kline's *Freedom*. In this installation, Kline uses speculative design to critique the intersection of technology and political control, filling the space with monitors depicting a near future in which drone-based "safety" tools enforce the suppression of dissent (2015). This method of distributing narrative nodes across a physicalized environment embeds context directly into the terrain. However, rather than broadcasting dystopian fiction, the screens in my project are informational. They ground the speculative African futurist landscape in the critical testimony of the present to inform the future.

Finally, drawing on Richard Serra's spatial manipulation in The Matter of Time (2005), the VR experience uses constrained movement to guide the user's focus, ensuring that the speculative technology and the voices of local foresight are encountered with deliberate, curated impact.

Fig. 10. *Richard Serra's The Matter of Time installation at the Guggenheim, Bilbao (2005).*

These design choices aim to compel users, who may be far removed from the artisanal mining crisis, to "feel" and "see" speculative futures as embodied experiences (Dunne & Raby, 2013). As creative director John Gaeta notes, VR allows audiences to "step inside" imagined worlds (Bucher, 2018), sharing the responsibility of speculation between the creator and the participant. This is critical for my thesis: the audience no longer observes a distant possibility but inhabits an immediate yet speculative future. In doing so, the installation not only embraces the expansion of documentary practice but also echoes Africanfuturist storytelling traditions, in which the present and the future coexist.

In addition, I'm aware that the use of VR introduces an inherent epistemological paradox regarding accessibility. The project utilizes high-fidelity Western-developed hardware to advocate for communities on the wrong side of the digital divide. With low internet penetration in Africa, the primary stakeholders, the artisanal miners, are unlikely to experience this artifact directly. Acknowledging this constraint, the VR documentary is not a tool for the miners themselves but as an empathy engine for advocacy directed at the diaspora, policy-makers, and global investors. I aim to use the power of the medium to bridge the gap between unregulated extraction and the boardrooms where policy is created.

4. THE AFRICANFUTURIST DESIGN FRAMEWORK

4.1 THE DECOLONIAL FORESIGHT METHOD (DFM)

This project introduces an innovative methodological framework for developing sovereign technology, drawing its terminology directly from the academic call to dismantle Western-centric prediction models. The Decolonial Foresight Method (DFM) transforms this existing theoretical discourse into an applied research methodology by integrating three distinct yet complementary disciplines: African epistemologies, local foresight, and, in this context, speculative design. The main argument of this thesis is that these three pillars collectively constitute a replicable methodological framework for decolonial technological innovation in Africa, one that advances beyond sociotechnical critique to tangible engineering actions.

The following equations define this framework:

Africanfuturism + Local Foresight + Material Translation = Decolonial Foresight Method

Decolonial Foresight Method = Decolonial Technological Innovation in Africa

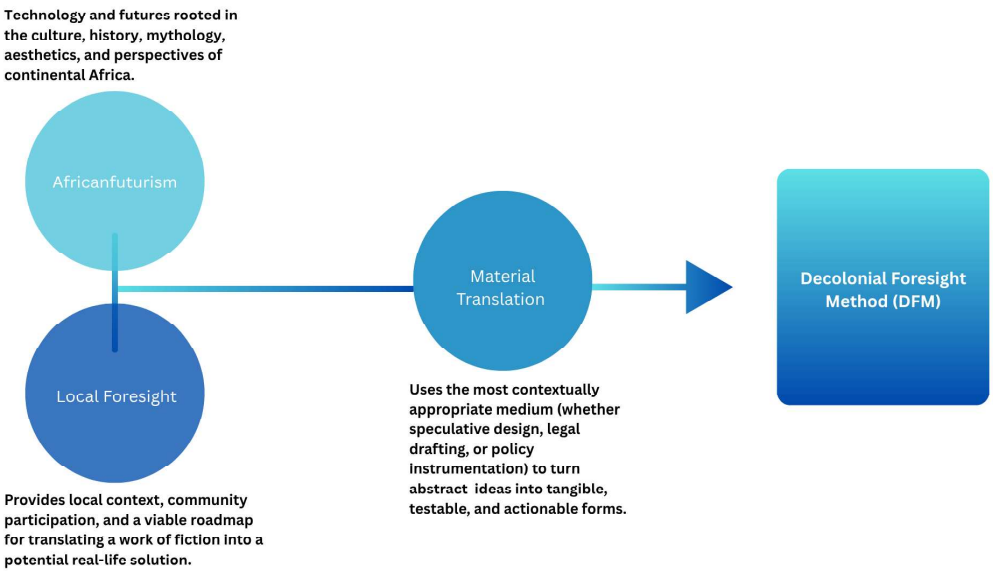

Fig. 11. *The Decolonial Foresight Method: a proposed research methodology for decolonial innovation.*

In this synthesis, Africanfuturism provides the epistemological grounding, ensuring the technology is rooted in continental philosophies, cyclical time, and cultural narratives rather than Western techno-utopianism. Local Foresight provides strategic viability, ensuring the technology responds to the community's long-term economic and infrastructural realities and shifts the user from a passive labourer to an active stakeholder. Finally, Material Translation — in this iteration, taking the form of Speculative Design and VR prototyping — uses design fiction to make these abstract concepts tangible and testable. The form is determined by deployment context rather than disciplinary convention, and Speculative Design represents one instance of what Material Translation can produce. It is critical to note that "innovation" and "technology" are used here in their broadest, most strategic senses, as in Mavhunga's (2017) Shona concept of *mazano*.

To operationalize this framework, I planned to create a VR environment that simulates a speculative mining site in Lagos, Nigeria. In this setup, I envisioned informational screens placed across the terrain to serve as diegetic context nodes. These screens display short videos derived from qualitative expert interviews, providing historical and theoretical context for the environment and explaining the urgent need for the speculative device that the audience will encounter later in the virtual space.

Through qualitative interviews on technology, mining in Africa, and local foresight, and by editing them into a topical narrative, the VR environment delegates narrative authority to the experts. By the end of the audience's journey, they experience an environment that spatially grounds them, receive full context from the videos on the screens, and finally encounter the 3D-modelled speculative device designed for ethical cobalt mining. This spatial strategy ensures that the audience understands the "why" before they interact with the "what".

4.2 THE FUNCTIONAL DESIGN SYSTEM

Building the VR prototype involved translating the theoretical framework into tangible specifications. To do this, I established functional design criteria for the speculative mining device by operationalizing my proposed framework through qualitative interviews with experts. For this Research-Creation thesis, an "expert" is explicitly defined as someone with specialized, applied knowledge in fields critical to the speculative intervention. It was also crucial that the insights came from Black African experts. This ensured that the final VR artifact serves as a credible exercise in decolonial engineering.

The DFM envisions two phases of Local Foresight: *Phase 1 involves Diasporic Foresight*, a structured consultation with African practitioners who occupy the same geographic intersection that this project examines: the space between Western institutional resources

and continental African cultural knowledge. It is a deliberate and principled first stage. *Phase 2 includes Community Foresight*, which consists of co-design workshops conducted directly with active artisanal miners in Ogun and Oyo states. This remains the essential next step of the framework. The current expert panel develops a design that is culturally grounded and technically coherent; Phase 2 will test whether it is experientially accurate. The DFM is only partially complete until both phases are finished.

For this project, the primary objectives of these interviews were to gather insights that inform the design of the speculative device and the narrative structure, or “talking heads,” of the VR documentary. The interview scripts were structured as conversational, creative explorations that moved from establishing current realities to envisioning future possibilities. Each session, approximately 60 minutes in duration, followed a semi-structured format. This approach allows for flexible exploration of themes while ensuring that core research questions regarding technological realities, speculation, ethics, and community integration are addressed. I categorized the questionnaires into four distinct local expert groups, each feeding into the framework this project proposes: mining, technology, local foresight, and speculative design (available in Appendix II).

4.2.1 INTERVIEW 1: TOLU OLOWOFOYEKU (BIOMIMICRY)

To ground the visual language of the speculative device in authentic Africanfuturist practice, a semi-structured interview was conducted with Tolu Olowofoyeku, the story developer and cultural consultant for Disney+ *Iwájú* (2024). The animated series set a precedent for depicting a futuristic Lagos that remains texturally distinct from Western science fiction. The objective of this interview was to decode the design rules of that world, specifically regarding infrastructure and mobility, and translate them into the ethical cobalt-mining device.

A critical segment of the interview focused on mobility across Lagos's complex, often unpaved terrain. Olowofoyeku noted that in environments where roads may be uneven or nonexistent, analogous to the precarious terrain of an artisanal mine site, a legged mechanism offers greater stability and precision than wheeled vehicles. He highlighted the utility of biomimicry, specifically citing the "Spider Shape" as a superior archetype for navigating difficult topography. In the context of artisanal mining, where shaft collapse is a lethal risk, a heavy-treaded vehicle creates dangerous vibrations and ground pressure. The hexapod design would distribute weight across six points of contact, allowing the machine to navigate fragile landscapes lightly and minimizing the risk to the human miners working alongside it.

The suggestion of the hexapod "spider" configuration immediately brought to mind the Akan tradition of Ananse (Anansi), inadvertently aligning the mining technology with West African folklore. As Molefi Kete Asante notes, Ananse, whose original form is a spider, is known as a trickster-deity “who teaches moral, ethical, political, or social values based on his ability to lead a person to the truth through example, puzzles, and the least-expected turns and twists of fate” (2024). According to Emily Zobel Marshall, a leading scholar on how the Anansi myth was used as a tool for resistance against colonialism and slavery, in Akan cosmology, Ananse is also often revered as a creator figure associated with wisdom, who subverts the brute strength of more powerful adversaries through cunning and ingenuity (2012). Adopting this bio-mimetic form supports my thesis’s decolonial goal, as Ananse symbolizes the "triumph of the weak over the powerful" and a spirit of psychological resistance against oppressive structures (Marshall, 2012). The speculative device now represents a technology of stewardship rather than dominance, navigating the terrain with precision that treats the land respectfully, not as a passive resource to be consumed.

It is worth pausing to address a methodological distinction that the Anansi alignment makes visible. Akan cosmology originates in Ghana, not in the Yoruba cultural landscape of southwestern Nigeria, where the device will be speculatively deployed. My thesis’s commitment to epistemological specificity must account for this geographic difference rather than treat pan-African mythology as interchangeable. Here, the DFM operates on two distinct levels that must not be collapsed. At the implementation level, the device remains culturally specific to its deployment community, and any future in-situ co-design process would be governed by Yoruba knowledge systems and land philosophies. At the methodological level, however, the DFM draws on the full breadth of African indigenous epistemologies as a collective design resource. As the goal is to apply it across the African continent, it is designed to synthesize the continent's speculative and indigenous knowledge traditions.

Furthermore, Olowofoyeku emphasized that authentic Africanfuturist technology should prioritize repairability. Unlike the "sealed" aesthetic of Silicon Valley tech, the assets in *Iwájú* (2024) often feature exposed mechanical elements, implying local engineers can fix them. This visual language conveys that the technology for the speculative device is locally governable, a tool the community can maintain, repair, and modify, rather than a "black box" imported from the Global North.

4.2.2 INTERVIEW 2: PATRICIA MWENDA (SOMATIC SENSING)

Following the definition of the device’s physical form, a second semi-structured interview was conducted with Patricia Mwenda, the Africanfuturist designer featured in the contextual

review, who specializes in physical computing and somatic wearables. The interview questions for Patricia were modified following Olowofoyeku's responses. While the previous interview established how the machine moves, this session sought to define how the machine feels. Mwenda's expertise in "technologies of care", specifically devices that mediate personal trauma, was pivotal in translating the macro-industrial act of mining into an intimate, sensory process.

Mwenda proposed that for mining to be truly ethical, the extraction device must function as a diagnostic tool rather than a blunt instrument. In the interview, she introduced the concept of haptic telemetry, used as feedback in video games, as a safety mechanism. She argued that while the operator should see the mine through a camera, they should also feel the earth's geological density through the device's controls. Specifically, Mwenda described a feedback loop in which the hexapod transmits "resistance" data to the operator via vibration. If the machine encounters fragile soil or a potential fracture point, the operator feels a "resistance" or "stop" signal in their hands. This turns the act of mining into a tactile dialogue; the machine "knows that something is going on and should completely stop," preventing the catastrophic shaft collapses that plague current artisanal mining operations.

This calibrated sensory intimacy reframes extraction from an act of industrial domination into a negotiated interaction with the terrain itself, allowing the miner to engage with the earth through perception rather than physical suffering. Operationalizing Mwenda's emphasis on somatic care and bodily awareness repositions the miner's role from a vulnerable labourer to a technologically mediated steward. The design would deliberately remove the body from direct exposure to the hazardous mining pit, thereby reducing respiratory and physical risk, while simultaneously establishing a remote sensory connection through haptic feedback systems.

4.2.3 INTERVIEW 3: YAW SARKODIE (LOCAL STEWARDSHIP)

While Tolu gave the "Body" (the spider shape) and Patricia gave the "Senses" (haptic feedback), Yaw provided the "Brain" or Network. His insights move the project from a mining device to a system of economic agency. A final semi-structured interview was conducted with Yaw Sarkodie, a strategic foresight practitioner specializing in African markets. This session focused on the systemic implications, drawing on Sarkodie's expertise as a growth architect and strategist who specializes in designing leverage into scale for organizations ranging from emerging ventures to Fortune 500 companies. I leveraged his experience living in different states and working in Nigeria, along with his expertise in "Horizon 2 & 3"

planning, to address a critical question: Once the device ethically extracts cobalt, how does that value remain within the local community?

Sarkodie challenged the notion that the device's primary value lies in physical extraction, arguing that African culture is inherently non-exploitative and depends on systems that include family and the community. Instead, he argued that in the "Horizon 3" (long-term transformative) future, the device's true power lies in integrating mining, agriculture, and geospatial data. He introduced the concept of a mining device that also acts as a scanning hub. As the hexapod traverses the terrain, it doesn't just extract ore; it maps soil composition, agricultural potential, and mineral density, uploading this to a local cloud network. Sarkodie likened this to an "Uber for Minerals" model: instead of foreign companies owning the survey data, the local miners own the map. They can sell the data to buyers or government agencies, creating a revenue stream that exists even when they aren't physically mining. This insight expanded the device's function from a mining tool to a land stewardship platform, complementing an earlier suggestion by Patricia Mwenda.

Integrating agriculture with mining would mean the device's scanner would be programmed to identify not just cobalt but also soil pH and hydration levels critical for staple crops like cassava and yams. This allows the machine to be utilized by farming cooperatives during the wet season, when mining is often too dangerous, thereby ensuring year-round economic utility and fostering peace between competing land users. Sarkodie also addressed accessibility for this implementation. Specifically, how the device could function effectively in communities with varying levels of text-based literacy, his suggestion was a non-verbal, LED-colour-coded interface that drew on familiar visual logic, similar to a traffic light system, to communicate soil and geological data without requiring written language. The result is a simple, legible feedback system:

Red (Halt): Severe ecological degradation or toxic soil. The land needs rest. It holds neither agricultural nor mineral viability at this time.
Yellow (Caution): Fragile, transitional soil with limited agricultural potential. Light, rehabilitative cultivation is advisable.
Green (Flourish): Healthy, stable soil with strong agricultural fertility. A safe zone for community farming.
Purple (Leverage & Protection): High concentration of battery minerals (cobalt or lithium). This signal also prompts the hexapod to activate its local mesh network, protecting the community's data sovereignty and preventing high-value coordinates from being captured by external corporate mapping.

This input ensures the prototype's intelligence remains immediately readable and exclusively useful to the communities it is designed to serve.

Adding a centralized data hub enhances the project's focus on miner agency by viewing data as a shared civic resource. The interface introduces a speculative workflow that grants local miners a form of "data citizenship," enabling them to collect and own geospatial and environmental data generated by mining activities. In this approach, the state protects these digital assets in return for adherence to environmental standards, fostering a reciprocal relationship. This forward-looking perspective envisions a pathway to transform informal mining practices into a regulated, community-oriented system, repositioning local miners as both resource extractors and guardians of environmentally significant data.

4.3 CAPTURING THE INTERVIEWS

Where logistically feasible, interviews were recorded using volumetric capture technology. This method translated the subject's physical performance into a three-dimensional digital asset, embedding their embodied presence in the virtual terrain. This high-fidelity capture aligns with the thesis's objective of making local knowledge experientially tangible.

Conversely, to ensure the framework was informed by a diverse group of experts without geographic constraints, supplementary interviews were conducted remotely via Zoom. Although it yielded a two-dimensional video, this remote approach was crucial for bridging diasporic distances and ensuring that the theoretical architecture of the virtual space and the speculative device were guided by the available ideal Pan-African expertise.

5. METHODOLOGY

The Decolonial Foresight Method provides the overarching methodological framework for this research. Within it, a Mixed-Methods Research-Creation approach governs the practical execution, comprising four main components: Research-Creation, Storytelling in VR, an Iterative Process, and insights from the Qualitative Interviews.

5.1 RESEARCH-CREATION

Research-Creation (R-C) is the central methodological framework for this project. As Owen Chapman and Kim Sawchuk note in their foundational article, Research-Creation: Intervention, Analysis and “Family Resemblances,” these projects “typically integrate a creative process, experimental aesthetic component, or an artistic work as an integral part of the study” (2012). This approach is vital because my proposal to synthesize Africanfuturism, speculative design, and local foresight into a cohesive framework would remain purely theoretical without a material testing ground. While the VR prototype is illustrative, more importantly, it serves as a speculative probe and experiential testing site to validate how these theories operate in physical space and user interaction. To articulate exactly how "making" functions as research, this methodology adopts renowned culture historian Sir Christopher Frayling’s (1993) foundational taxonomy of practice-led inquiry, structuring the workflow into *Research-for-Creation* and *Research-through-Creation.*

Aligned with Frayling’s definition of research for design, in which data is gathered explicitly to support the creation of an artifact, this initial phase involved synthesizing the qualitative expert interviews to author the VR world. This included a contextual review of Africanfuturist literature and speculative design, and crucially, expert interviews that suggested biomimicry, haptic telemetry, and data sovereignty. This served as the data-gathering mechanism required to establish the Functional Design System (detailed in Chapter 3), providing the structural and conceptual blueprints for building the speculative environment and the device.

The second phase aligns with what Frayling terms research *through* design, and what artist and researcher Maarit Mäkelä (2007) describes as "knowing through making." The physical act of building the world generated new insights that could not have been discovered through writing or theory alone. For example, translating the Africanfuturist concept of cyclical time (*Sasa* and *Zamani*) into a spatial reality required iterative problem-solving. Figuring out how to spatially organize speculative technologies, such as interactive floating screens, drones, wind turbines, and solar farms, so they coexist organically with a natural Nigerian mining landscape forced critical decisions about scale, narrative pacing, and user

embodiment. The "making" itself became a form of speculative inquiry, testing whether an African futurist landscape could successfully support this proposed industrial narrative.

5.2 SPECULATIVE STORYTELLING IN VR

As a visual storyteller, I have always been fascinated by how environments convey meaning beyond dialogue or action. In this project, I translate that cinematic concept into VR, using environmental storytelling to architect a speculative world. The VR prototype was conceived to reimagine a Nigerian mining site, historically a landscape of extraction and vulnerability, into a cultural landmark of remediation and renewal. By juxtaposing present-day realism with speculative technologies, the terrain becomes a visual metaphor for temporal coexistence, where the present and the future unfold simultaneously. The goal is for the terrain's topology to function as a narrative guide, directing the user's embodied journey and allowing the story to emerge organically from movement, perspective, and interaction.

Creating stories in VR is distinct from other creative forms in that it shapes how narratives are constructed and experienced by emphasizing participation, embodiment, and environmental interaction. As John Bucher (2018) outlines in "Storytelling for Virtual Reality," VR fundamentally shifts narrative authorship by "placing the participant at the center of the story," allowing meaning to emerge through experience rather than observation. This mode of storytelling aligns with my goal of exploratory engagement, where users navigate space, encounter information, and piece together narrative fragments through their own movement and curiosity. Inspired by Bucher's (2018) suggestions on immersive storytelling, I structured the virtual environment around the traditional three-act storytelling framework.

The first act, or beginning, would introduce the user to the world through three contextual screens that highlight the socio-environmental issues related to cobalt mining and briefly introduce Africanfuturism as a sci-fi subgenre. This establishes both the narrative and ethical foundations, situating the user within the speculative premise. The second act, or middle, centers on a circular monument flanked by floating screens. This spatial layout is a key feature symbolizing cyclical temporality in African epistemologies, particularly Sasa and Zamani, where the past, present, and future coexist in continuity. This design breaks the linear flow of the terrain and encourages the user to navigate around the monument to interact with both screens. The final act, or conclusion, guides the user toward the mining pit, where screens display the speculative design process and the conceptual development of the proposed ethical mining device. The user observes how the speculative intervention emerges from research, local foresight, and Africanfuturist imagination.

The VR installation avoids sensationalizing mining by prioritizing testimony, contextual analysis, and ethical speculation instead of spectacle. The project follows a design justice principle, that speculative storytelling must expand agency rather than reinforce vulnerability, by foregrounding miners' lived realities and memorializing lost futures through the central monument. Thus, the future imagined in this VR space is not a fantasy about Africa, but a world-building practice rooted in African agency (Costanza-Chock, 2020).

The full script for the VR experience is available in Appendix A.

5.3 STORYBOARDING

To anticipate how users would move through and interpret the speculative mining environment, I created a storyboard that mapped the user journey. This functioned as an experiential blueprint, clarifying the emotional beats, informational pacing, and spatial transitions that would structure the VR experience. It also allowed me to refine how information would unfold over time and ensured that the VR experience maintained a coherent rhythm consistent with documentary storytelling.

Fig. 12. *Storyboard sketches of the user journey and an overview of the terrain.*

5.4 ITERATIVE PROCESS: THINKING THROUGH MAKING

My design process began with extensive visual research into artisanal mining sites across Africa, focusing on the Democratic Republic of Congo and southwestern Nigeria. By examining these environments through the lens of my background in vérité-style documentary filmmaking, I gained critical insight into the spatial and material realities of artisanal and industrial mining, including their adverse ecological impacts and the human toll.

Using Unity (version 6), a real-time development platform for creating interactive 3D and VR environments, I began constructing the terrain using its terrain builder. Due to my limited

prior experience with Unity, I adopted the integrated creative process of Thinking Through Making. This approach, rooted in Donald Schön's (1983) concept of reflection-in-action, operated as a digital manifestation of Mavhunga's theory of *mazano*, the indigenous practice of strategic and creative problem-solving, and was a necessary methodological strategy. It allowed knowledge and critical arguments to emerge directly during digital prototyping, rather than being confined to the conceptual stages preceding or following the build. Specifically, this immediate feedback loop between conceptualization and material engagement accelerated the validation of the project's core design arguments.

The workflow followed a customized iterative design methodology characterized by continuous cycles of planning, building, examining, and refining. The design cycle was structured to integrate creative ideation and technical realization.

Brainstorm → Plan → Build → Examine → Refine

Instead of making a photorealistic replica of a current, devastated mine, I aimed to create an aspirational, Africanfuturist interpretation of a *remediated* environment. Drawing on Yaw Sarkodie's foresight regarding agricultural integration, the terrain was sculpted into a dual-use ecological space comprising a recovering landscape and a crater (mining pit). I went into a phase of design named "*game sketching*", an approach of thinking-through-making (Westecott, 2020) to explore the narrow, winding pathway through the terrain, inspired by Richard Serra's spatial design (Fig. 10) and real-life reference images (Fig. 13 & 14). The constrained movement is also a deliberate user experience constraint designed to manage cognitive load and direct narrative attention. This counters the infinite freedom typical of VR, forcing the user to engage with the environment's thematic juxtaposition rather than to explore freely.

Fig. 13 & 14. *Reference images from Gray Minerals mining site in Ibadan, Oyo state, Nigeria.*

The process of “game sketching,” as articulated by game studies scholar Emma Westecott (2020) within research-creation discourse, aligned intuitively with my vérité-style approach to documentary filmmaking. This method enabled rapid digital prototyping of key design arguments, including testing the experiential impact of the spatially constrained pathway and evaluating the placement and pacing of the interactive “talking head” screens. Echoing Josh Kline’s *Freedom* 2015) installation, these informational screens needed to be tested for pacing and scale before committing to resource-intensive, high-fidelity HDRP rendering. Treating these early Unity models as functional sketches rather than final outputs fostered an agile dialogue between Africanfuturism's speculative ambitions and the spatial constraints of VR, thereby validating the central mechanism for generating experiential empathy early in the process.

6. IMPLEMENTATION: THE DIEGETIC PROTOTYPE

Each terrain iteration cycle became an act of negotiation between realism and speculation. Besides constructing a virtual world, I was shaping a framework for thinking about how speculative environments can embody culture, ethical reflection, and collective imagination.

6.1 PROTOTYPE 1

The prototype was designed using Unity's Universal Render Pipeline (URP), a prebuilt, scriptable render pipeline that balances graphics quality and performance across an array of devices, including high-end PCs, mobile phones, and VR headsets (Unity Technologies). The terrain was divided into 3 parts, representing each of the story's acts. The initial linear path is the first act; the circular route in the middle is the second act; and the third act is the path leading to the mining pit beyond the round rock in the middle. Trees were used to cover the other parts of the terrain, depicting an eco-friendly environment. This choice was part of a broader compositional strategy inspired by the 60:30:10 colour ratio visual design principle (Lopez, 2023), aiming to create a balanced and harmonious colour scheme that establishes visual hierarchy and guides the participant's attention within the constrained VR environment.

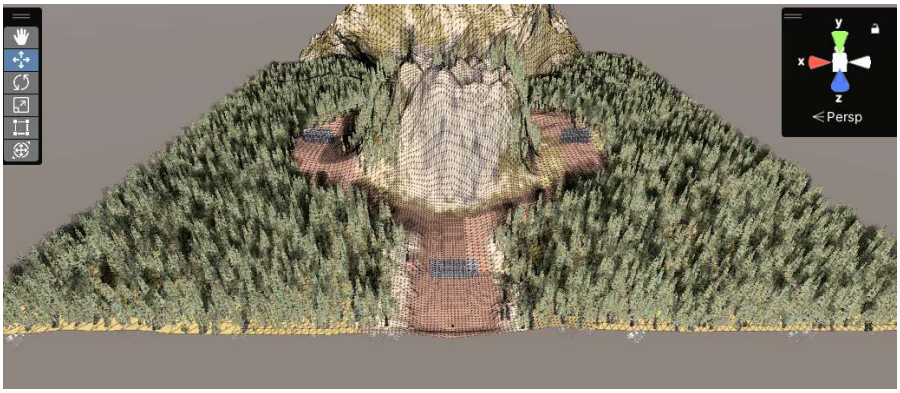

Fig. 15. *First prototype of the user's path being built across the terrain in Unity v.6.*

The dominant colour is 60% green, from the trees and the grass on the rocks. The 30% secondary colour is the reddish-brown tone used for the centralized pathway, which visually separates the structural route from the wilderness and reinforces mandatory navigation. Finally, the 10% accent colour is allocated to the small gray squares embedded along the path, which represent the critical interactive screens. This demonstrates an environmental design that functions as an invisible navigation system.

The primary objective of the prototype was to evaluate the placement of the floating informational screens. They were placed along the path to serve as guiding elements. Each screen provides context about cobalt mining, sustainability, Africanfuturism, and the speculative device, mirroring the interpretive displays found in museum spaces. While their function draws from Josh Kline's "*Freedom*" (2015) installation, the cinematic influence of Christopher Nolan's "*Interstellar*" (2014) was also central. In the film, the protagonist walks past archival interviews displayed on futuristic monitors, bridging past trauma and future hope. Similarly, in this VR environment, the screens allow users to experience the continuity between history, present urgency, and speculative potential.

Initially, the interactive screens were gray, then updated with a green tint to visually blend them into the VR environment (Fig. 16). However, this design was later revised to better highlight the screens' role as distinct informational nodes within the speculative space.

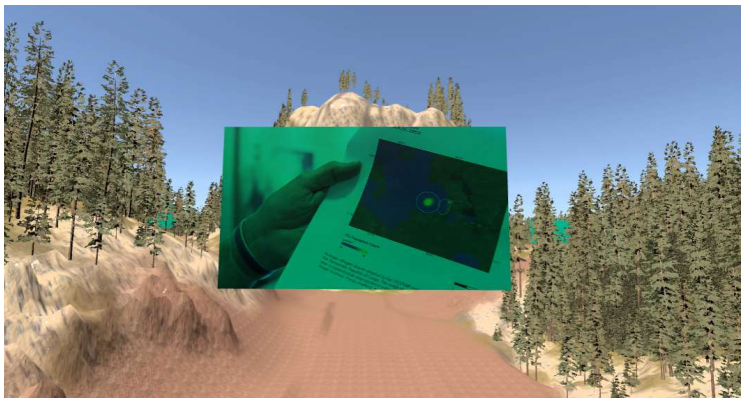

Fig. 16. *Initial design of interactive screen with green tint.*

6.2 PROTOTYPE 2

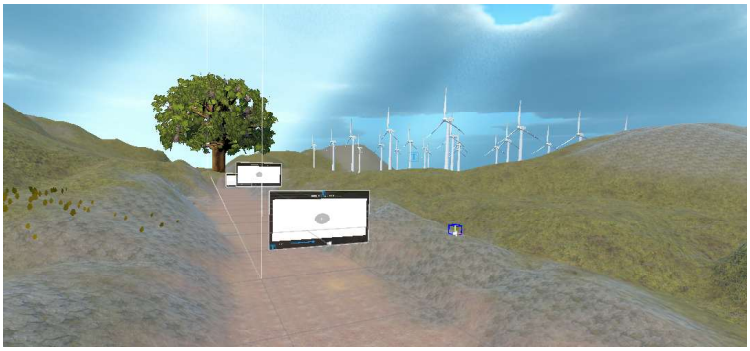

Fig. 17. *Refined terrain and screen design.*

Upon play-testing the early prototype, several design limitations became immediately apparent. The initial terrain felt overly rugged, preventing it from functioning as an

aspirational landmark within an Africanfuturist framework. Additionally, the vegetation assets I had used were not native to Nigeria, creating an unintended ecological inconsistency that undermined the project's cultural grounding. The green-tinted interface on the informational screens also proved counterproductive; rather than guiding attention, it obscured essential content and introduced unnecessary visual noise within the VR environment.

In response, I undertook a comprehensive reconstruction of the terrain, refining it by removing the forest on either side and replacing it with grassy hills and large rocks along the path. I also reworked the screen interface design. I replaced the previous green-tinted panels with a cleaner, more minimal user interface inspired by Unity's instructional monitor templates, redesigned to fit a more futuristic style. This redesign also supports the goal of usability and information prioritization, making the video footage stand out against the ecological backdrop.

A further critical iteration involved integrating wind turbines and a solar panel field toward the center of the terrain, which served a dual purpose central to the thesis. First, to visually demonstrate a speculative future for energy infrastructure within African mining landscapes. Secondly, the juxtaposition of current challenges and imagined technological solutions aligns with the project's core speculative proposition.

Finally, the large central rock formation used in the previous prototype was replaced with a sizable oak-like tree (Fig. 17) to introduce a more grounded, organic focal point, aligning the space with a sense of cultural rootedness. However, I removed it in subsequent iterations and replaced it with a structure that ensures the terrain's centrepiece carries greater symbolic resonance.

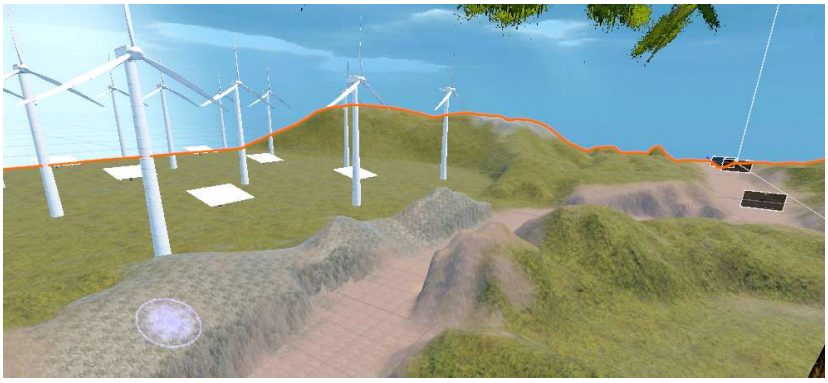

Fig. 18. *Wind turbines and solar panels added to the terrain.*

6.3 PROTOTYPE 3

Fig. 19. *Addition of the Memorial structure and a more dense solar panel field.*

The earlier prototype had a slightly cartoonish aesthetic that inadvertently undermined the gravity of the artisanal-mining context. While absolute photorealism was never the primary objective, it became clear that I required a heightened level of visual fidelity as a theoretical imperative. In response, I transitioned the project from Unity's Universal Render Pipeline (URP) to the High Definition Render Pipeline (HDRP), a system built for advanced material rendering, dynamic lighting, and advanced post-processing effects (Unity Technologies). This tangibility facilitates critical reflection, as when the viewer encounters a physically plausible environment, they may be more compelled to engage with the speculative technology as a viable engineering blueprint rather than a conceptual fantasy. Grounding the Africanfuturist imaginary in the visual language of the real world maximizes the VR documentary's capacity to evoke experiential empathy, achieving its primary Research-Creation goal of modelling a believable, community-driven future.

All assets on the terrain, including the terrain itself, were upgraded to HDRP. I added additional solar panels to the solar farm to increase its density. I also introduced High-fidelity trees into the terrain, but I positioned them sparingly rather than creating a dense forest. This aesthetic choice is rooted in the "ethics of nature-relatedness" proposed by Nigerian philosopher Segun Ogungbemi (1997). Ogungbemi contends that in traditional African thought, humanity and the environment are spiritually interconnected; damaging the land is akin to damaging oneself. Consequently, intentionally blending the mining site with thriving vegetation aims to visually mend the "spiritual gap" left by extractive industries and to suggest a mining operation in harmony with nature.

I replaced the low-fidelity oak tree at the center of the terrain with a monument composed of two cylinder assets and a photogrammetric scan of my own palm, created using the

Scaniverse application. Transforming my own hand into a proxy for the countless children whose lives have been impacted or lost to exploitative mining labour serves as a personal homage. The resulting structure operates simultaneously as a memorial and a speculative artifact: a grounded reminder of historical harm embedded within a forward-looking environment.

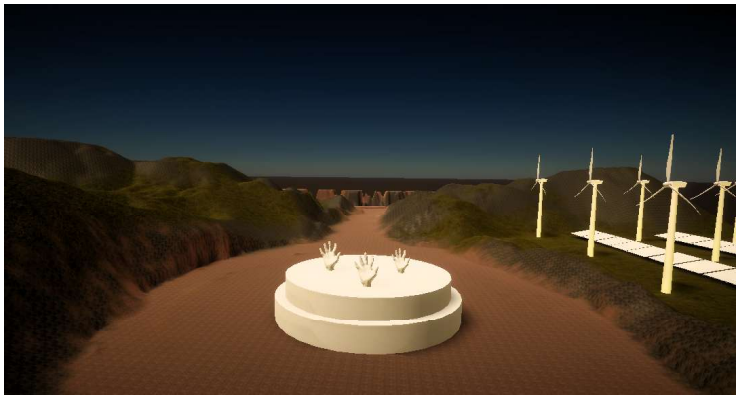

Fig. 20. *Alternative view of the monument with the mining pit in sight.*

6.4 PROTOTYPE 4

Fig. 21. *Improved atmospheric lighting and addition of purple sky.*

This prototype introduces a pivotal visual transition from a stark, high-contrast night scene to a serene purple sunrise, a shift made possible by fully leveraging the volumetric lighting and atmospheric capabilities of the High Definition Render Pipeline (HDRP). The addition of purple to the palette complements the terrain's dominant green tones, thereby achieving visual harmony. The sunrise was chosen for its dreamy and aspirational aesthetic, symbolizing a new dawn in mining technology. It serves as a universal symbol for change, rebirth, and hope. The solar panels were also rendered with a purple hue to match the sky’s palette, ensuring the energy infrastructure blended cohesively with the overall environmental composition.

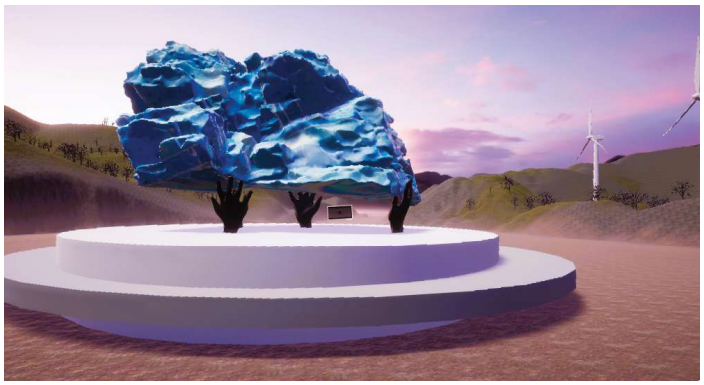

Fig. 22. *The refined central monument features a massive cobalt stone supported by hands representing African miners.*

The central monument underwent a significant aesthetic and conceptual change. The hands, previously untextured, were textured to represent Black Nigerians, supporting a massive cobalt stone that signifies the scale of the resource. The 3D stone asset uses a brightened, luminescent electric-blue texture that aligns with the popular impression of "Cobalt Blue", the deep pigment historically associated with cobalt salts, rather than the visual reality of the raw mineral. Geologically, a natural cobalt ore is typically a metallic silver-grey or steel-white hard rock, often indistinguishable from other industrial metals without chemical processing. However, this project frames the mineral as a "Real-Life Vibranium", necessitating a speculative stylization that elevates it above its mundane industrial appearance. The design prioritizes a visual signifier over geological accuracy to ensure immediate user recognition, transforming the object from a passive environmental asset into a vibrant symbol of energy and value.

I further placed an additional screen ahead (Fig. 22) to guide the user and provide a final contextualization of the speculative device they are about to encounter.

Fig. 23. *The mining pit at the end of the user journey.*

At the end of the user journey lies a mining pit, where the speculative hexapod device will be placed for the user to experience.

6.5 NAVIGATION & INTERACTIVITY

The goal of navigation and interactivity in the VR documentary is to emphasize intuitive usability and minimize technical barriers, allowing users to focus on the narrative content. Using the XR Interaction Toolkit in Unity, the system employs a standard Ray Interactor, visible as a white vector line extending from the controller (Fig. 24), which offers clear visual guidance for aiming the virtual hand.

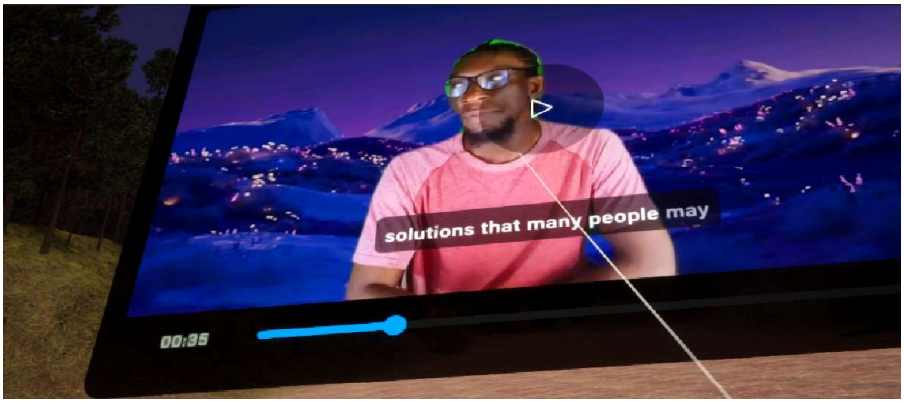

Fig. 24. *VR controller Ray Tracing for intuitive interactivity.*

This setup gives users complete control over floating informational screens by mimicking familiar media controls. It allows participants to control the pace of the experience, enabling them to play, pause, and scrub through the timeline with the blue progress slider. This also lets users absorb content at their own speed, boosting opportunities for critical reflection and experiential empathy.

After the user finishes viewing the content, each informational screen rotates 180 degrees when the user passes by. This ensures that if the participant turns back, the screen automatically faces them. It can be replayed without a full physical detour around the object. Following VR practices for spatial storytelling and user comfort, this design minimizes disorientation by avoiding backward navigation, which can disrupt immersion, while maintaining a smooth narrative flow.

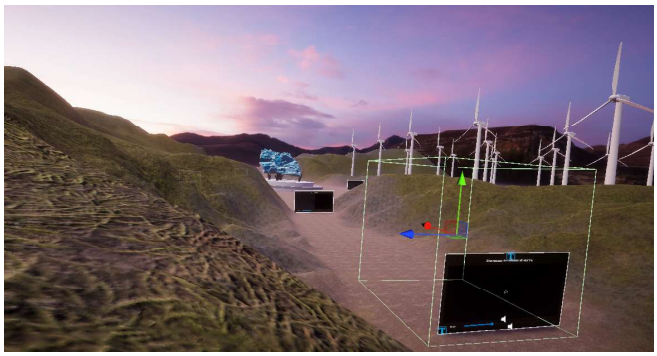

Fig. 25. *Invisible trigger collider that detects user movement and prompts the screen to rotate 180 degrees.*

Proximity trigger colliders were placed around interactive objects on the terrain, such as the volumetric figures, the central monument, and the speculative device at the terrain's end. Crystals were positioned at terrain points where the trigger would generate volumetric interactions, encouraging users to move in that direction.

Fig. 26. *A crystalline beacon functioning as a spatial trigger for the project's volumetric expert interviews.*

The core volumetric video segments use a custom preloading sequencer in Unity to ensure seamless audiovisual synchronization, while a sensor-driven kiosk mode automatically resets the entire environment for the next viewer the moment the headset is removed.

6.6 VOLUMETRIC CAPTURE PROCESS

This project used a multi-sensor volumetric capture technology to record two key interviews. I chose to include a “physical” representation of the co-creators in Toronto, Canada, as part of the virtual experience. Unlike stereoscopic 360-degree video, which traps the viewer in a fixed position, volumetric capture generates a six-degrees-of-freedom (6DoF) asset. This technology and its 3D output transform the interview from a static recording into an embodied encounter.

Fig. 27. *The Five-Sensor Volumetric Capture Array Setup*.

The physical capture environment was constructed using a five-sensor array, primarily oriented toward the contributor, configured to minimize occlusion and maximize texture fidelity. These sensors (Fig. 28) were selected for their ability to capture high-resolution RGB video synchronized with depth maps derived from infrared technology. The capture pipeline was managed via Depthkit Studio, a specialized software solution for high-end volumetric filmmaking. As shown in Fig. 29, the software visualized the intersecting frustums (viewing cones) of the five sensors, creating a reliable "safe zone" for the interview subject.

Fig. 28. *Microsoft Azure Kinect DK Depth Sensor Unit.*

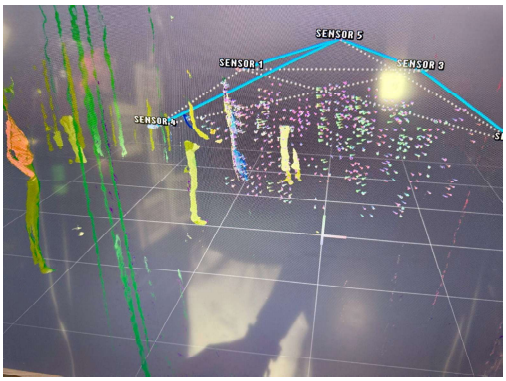

Fig. 29. *3D Sensor Alignment Visualization.*

The final assets were exported as combined video files containing both colour and encoded depth data. These were imported into the Unity project using the Depthkit Unity Plugin, which uses the Visual Effect Graph (VFX Graph) to render geometry in real time. This pipeline ensured that the interviews were rendered in high definition using the High-Definition Render Pipeline (HDRP).

Fig. 30. *Volumetric Integration of Patricia Mwenda and Yaw Sakordie within the virtual terrain.*

6.7 SOUND DESIGN

In an immersive documentary, sound design is a critical spatial and narrative tool. Drawing on my background in vérité documentary filmmaking, the VR experience's soundscape reflects the remediated, multi-utility ecosystem proposed by Yaw Sarkodie. Designed in collaboration with Nigerian composer Siji Olunuga, the ambient audio features the deep, rhythmic hum of nearby wind turbines and the occasional drone of propellers, blended with the subtle sounds of wind and birds from a recovering ecology, all underscored by a contemplative Afro-synth score.

Crucially, spatial audio (3D sound) is employed to anchor the voices of the experts (Tolu Olowofoyeku, Patricia Mwenda, and Yaw Sarkodie) to their respective floating screens. I enhanced the audio from their interviews in Adobe Audition and, after editing key parts in DaVinci Resolve, placed it on the terrain. I included proximity triggers that initiate the characters coming to life when players get close to them. As the user navigates the winding path, the volume and directionality of the expert testimony shift dynamically based on the user's proximity and head rotation. This spatialization ensures that the experts maintain narrative authority within the environment; their voices serve as guides for the user toward the central monument and, eventually, to the pit, where the user encounters the speculative device. When the device is finally revealed, its mechanical audio profile rejects the heavy, grinding sounds of traditional excavators. Instead, the sound was intentionally designed to evoke a light, rhythmic heartbeat. The heartbeat is among the most culturally persistent symbols of life, continuity, and renewal. Finally, navigation is also enhanced by a custom distance-tracking system that calculates the headset's movement to trigger realistic, spatialized footstep audio, instantly connecting the user to the terrain.

6.8 ACCESSIBILITY

Acknowledging that the primary stakeholders, the artisanal miners themselves, are unlikely to experience this digital artifact directly, the accessibility strategy for this project focuses on maximizing its reach and usability as an "empathy engine" for diasporic audiences, policymakers, and global investors.

Within the software itself, accessibility is prioritized through several key design choices. The constrained, relatively flat pathway design ensures the experience is fully accessible for both room-scale movement and seated play. Users with mobility constraints can navigate the entire narrative sequence without requiring complex physical crouching, turning, or extended reaching. Moreover, given the paramount importance of the Local Foresight interviews, all floating informational screens are accompanied by clear, high-contrast subtitles. This ensures the expert testimony remains accessible to d/Deaf and hard-of-hearing users, as well as those processing complex, specialized information. Finally, the UI elements, including the Ray Interactor and media scrubbing sliders, utilize high-contrast colours (such as the bright ray and blue progress bar) to ensure they stand out clearly against the earthy, muted tones of the mining terrain, accommodating users with varying degrees of visual acuity.

Finally, to make this research accessible beyond the limited hardware of institutional VR spaces, I created a comprehensive summary as a 2D cinematic export of the VR documentary experience. This linear video format democratizes access for audiences, especially in the Global South, who may be unable to physically or geographically engage with spatial computing. Additionally, accessibility is built into the virtual environment through the terrain's split design. Recognizing that the volumetric interviews on the right trajectory face sensory and technical challenges with integrated text, the left trajectory was intentionally designed using traditional 2D documentary formats. This ensures that users who need closed captioning due to auditory or hearing impairments can fully navigate and understand the project's core content.

6.9 THE SPECULATIVE DEVICE: *OKO AYO*

As a physical manifestation of insights from the interviews, this speculative hexapod device aims to control and reclaim spaces where human life and local ecologies have been systematically subordinated to the demands of global capitalism. This violence has been physically, culturally, and linguistically reinforced by Western industrial engineering (Mavhunga, 2017). Nigerian environmentalist Nnimmo Bassey argues that the language and practice of extractive industries conceptually reduce the African continent to a dead

repository, linguistically coding the local landscape as a passive site meant solely to be violently gutted for global capital (Bassey, 2012). Functional titles such as excavators, crushers, and predators name traditional mining machinery, emphasizing brute force, domination, and the destruction of terrain.

Dismantling this colonial paradigm requires more than redesigning hardware; the Decolonial Foresight Method (DFM) requires that indigenous speculative technology enact a radical linguistic intervention. As Kenyan academic Ngũgĩ wa Thiong'o asserts, language is the primary vehicle by which a culture defines its reality, meaning that retaining Western terminology fundamentally compromises the decolonial ambition of any new infrastructure (1986). Recognizing its operational reality as an earth-moving tool, the device demands a title that subverts extractive vocabulary and emphasizes the restorative, agricultural, and data-sovereign capabilities of its biomimetic design. Therefore, as my speculative mining site is set in southwestern Nigeria, I merged the Yoruba term Oko[1] (a protective vehicle or craft) with Ayo (joy, representing holistic well-being). With this title, what I have previously described as "the speculative device" and "the speculative hexapod" is formalized as *Oko Ayo*: a Vessel or Vehicle of Joy, thereby firmly illustrating its primary purposes: bringing joy to local communities, promoting harmony with the land, and anchoring the hardware's identity within African epistemology.

To visualize the speculative hexapod, I collaborated with Setonji Hotonu, a Nigerian multidisciplinary 3D artist and animator. The resulting 3D asset is the direct physical materialization of the Decolonial Foresight Method (DFM). Every structural and functional component of the *Oko Ayo* prototype was informed by the speculative insights gathered from the expert triad.

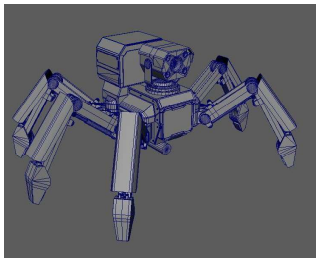

Fig. 31. *3D mesh wireframe of the Oko Ayo.*

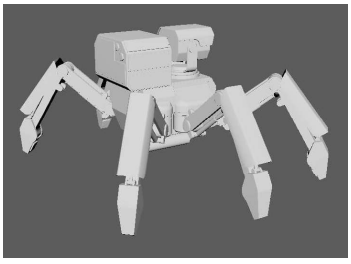

Fig. 32. *Solid 3D blockout model of the Oko Ayo.*

[1] In Yoruba, tonal pitch and vowel quality fundamentally shape meaning. *Ọkọ̀* — open vowels, a falling tone (aw-kaw) — refers to a vessel or vehicle, something that carries. *Oko* — closed vowels, a neutral mid-tone (oh-koh) — refers to a farm or place of cultivation. The two words are near-identical in their anglicized form, which is why this thesis uses the simplified spelling "Oko" intentionally: to hold both meanings at once. The Oko Ayo is the physical vessel (*Ọkọ̀*) and the cultivated ecology (*Oko*) it supports within the mining crater — carrier and cultivated land, at the same time.

Drawing directly from Tolu Olowofoyeku’s mandate for biomimetic engineering, the vehicle utilizes a hexapod (spider-like) form factor. The six articulating legs minimize the machine's footprint, treading lightly to preserve soil integrity. The outer plating of these legs features integrated, leaf-patterned solar panels that embed renewable energy harvesting directly into the biomimetic aesthetic. Responding to Patricia Mwenda’s framework for somatic care, the prominent optical and LiDAR sensor cluster mounted on the top chassis would scan the earth for ore density and to continuously read the structural stability of the pit walls to prevent collapses. In tandem with the operator's haptic telemetry controller or suit, this array monitors the physical environment to ensure that artisanal labourers working in proximity to the device are shielded from ecological precarity.

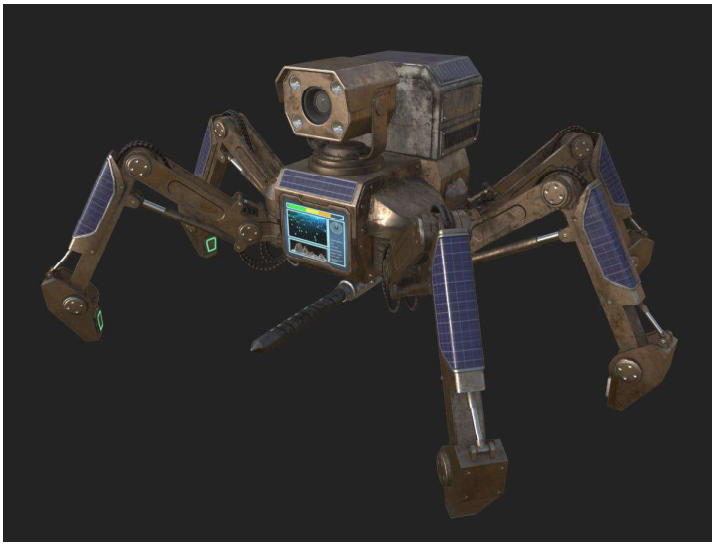

Fig. 33. *The final high-fidelity concept visualization of the biomimetic hexapod.*

Finally, to satisfy Yaw Sarkodie's requirement for local data sovereignty, the central body of the *Oko Ayo* features an integrated, outward-facing digital display screen. This screen displays real-time topographical mapping and system diagnostics directly to the miners on the ground. Placing the data interface on the exterior of the machine, rather than routing it to a remote corporate server, makes the device function as a closed-loop mesh network. It guarantees that the knowledge and environmental data generated by the *Oko Ayo* remain the exclusive property of the local mining community.

6.10. THE FINAL PROTOTYPE

The final spatial design of the VR terrain intentionally diverges from linear Western storytelling, taking the form of a sprawling tree. This non-linear path encourages users to make active choices in navigation, symbolizing the integration of past, present, and future

approaches. The right route immerses users in a speculative future, guiding them through a landscape of renewable wind turbines and three-dimensional volumetric interviews. In stark contrast, the left route connects users to organic renewal and documentary tradition, characterized by thriving, reclaimed vegetation and traditional, two-dimensional "talking head" testimonials. Both technological and organic pathways converge at the central monument, a unified, timeless space of reflection and integration. From this communal trunk, a single direct path leads down into the deep crater of the mining pit.

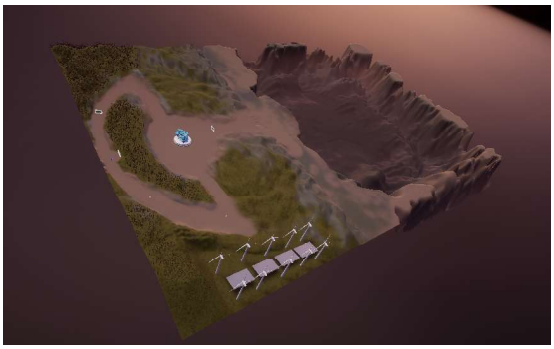

Fig. 34. *3D image of the VR terrain topography.*

Fig. 35. *Right route: Renewable Infrastructure.*

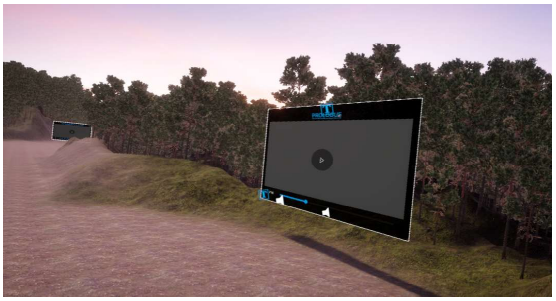

Fig. 36. *Left route: Final 2D video player screens.*

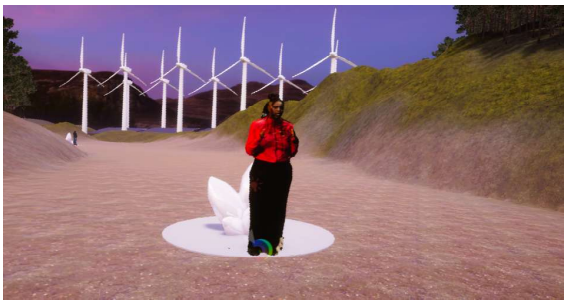

Fig. 37. *Final volumetric character platforms.*

Fig. 38. *3D rendered Oko Ayo at the end of the user journey.*

7. REFLECTION

What started as a creative exploration of spatial computing and visual world-building ultimately evolved into a thorough critique of geopolitics and law. At first, the instinct of a cinematic storyteller was to use VR mainly as an aesthetic tool to visualize an Africanfuturist landscape. However, the process of conceptualizing the terrain demanded a much deeper immersion into the harsh realities of the global extraction industry. This project culminated in a profound awareness of the current ecological conditions, technological limitations, and legal frameworks, specifically the Nigerian Minerals and Mining Act of 2007, that govern the artisanal pits of southwestern Nigeria.

Recent escalations across the country's mineral belts highlight the urgency of exploring such speculative interventions. The extraction of battery metals has transformed into a self-sustaining conflict economy. Armed non-state actors and bandits are now seizing remote natural resource sites to fund their operations, displacing indigenous farming communities and forcing them into exploitative pit labour under the threat of violence. This escalating crisis serves as a stark, material realization of the necropolitical "death-worlds" introduced at the outset of this thesis, zones in which human life and ecological survival are brutally subordinated to the economics of extraction. Recognizing that these marginalized workers are caught between global corporate demand and local armed insurgencies has fundamentally changed the scope of this research. Importantly, this global demand is heavily influenced from within Canada, with Toronto serving as the undisputed financial hub of the global extractive industry, where most of the world's mining and exploration companies are headquartered or listed. The capital that indirectly fuels these conflict economies flows directly through the city where this project was developed. Conducting this exploration now, especially within the Canadian academic sphere, is no coincidence. It places the Decolonial Foresight Method at the core of the extractive system, with the potential to compel the Global North's financial structure to explore an ethical alternative.

Notably, this development was prompted by the discovery of a rich, expansive network of Black and African scholars and designers, which laid the theoretical groundwork for the Decolonial Foresight Method (DFM).

7.1 CRITICAL FABULATION AND THE LIMITS OF THE ARCHIVE

The transition from traditional lens-based documentary into spatial computing required a fundamental reassessment of how trauma, memory, and possible futures are archived. Initially, my instinct as a cinematic storyteller is to point a lens at the present reality to expose

an injustice. However, examining the artisanal mining pits of southwestern Nigeria revealed the limits of traditional observational framing. The official archives and prevailing global narratives offer only a vocabulary of exploitation and extraction, frequently trapping these marginalized spaces in an endless loop of present trauma with little or no speculated solutions.

Engaging deeply with decolonial theory revealed that capturing the "death-world" as it exists without proposing solutions for local stakeholders is inadequate; it simply reproduces the colonial gaze and reduces this virtual experience of the Global South to a site of digital poverty tourism. It is within this profound archival silence that the Decolonial Foresight Method (DFM) transcends standard design practice, functioning as an engine for what Saidiya Hartman terms "critical fabulation." An American academic and writer specializing in African-American studies, Hartman contends that when the historical records of the oppressed are defined solely by omission, researchers must engage in informed, speculative storytelling to reconstruct the narratives that colonial institutions choose to ignore (2008). Synthesizing local foresight with African epistemology, the VR environment and the *Oko Ayo* serve as an active archival intervention. It is a virtual construction of a restorative, contemplative, and decolonial future that most colonial frameworks have failed to explore.

It is vital to mention that although framing the speculative device as operating within a 'post-legislative reality' is a necessary creative choice, it carries a cost that must be named directly. The Nigerian Minerals and Mining Act of 2007 does not merely complicate community ownership of the *Oko Ayo*; it legally prohibits it. Every design feature that positions the local mining community as sovereign owners of their geological data, their device, and their land presupposes a legislative transformation that no speculative design methodology can produce. This does not invalidate the Oko Ayo as a design proposition; design fiction has historically functioned as a pressure instrument on policy, and envisioning what governance should look like is a legitimate precondition for demanding it. However, future iterations of this project must engage directly with legal scholars, Nigerian policy practitioners, and community organizers to map the specific legislative amendments that would need to accompany any physical deployment of this framework. The DFM, as currently constructed, is a design methodology rather than a governance strategy, and it requires a parallel political project to become fully operational.

A further precondition must be named alongside the legislative one. The *Oko Ayo* is designed around the assumption of a community stable enough to govern and protect its own data infrastructure. A device that generates and stores high-value geospatial data in a

closed community mesh network becomes, in an active conflict economy, a target. A data sovereignty architecture that is designed to exclude global corporations offers no inherent protection against local armed actors for whom that data represents the same leverage it would give the community itself. a security precondition that sits alongside the legislative transformation already acknowledged: the *Oko Ayo* cannot be deployed into a conflict zone and remain a community asset. The stabilization of the mining environment, through the community security measures, formalization processes, and state protections that Nigerian policy practitioners and local organizers must lead, is therefore a prerequisite for this methodology.

7.2 THE ETHICS OF SPECULATION

As the conceptual framework evolved, so did an understanding of the immense ethical friction inherent in speculative engineering. Early in the research, the *Oko Ayo* hexapod was largely evaluated through the lens of ethical mining and ecological sustainability. Yet rigorous critical reflection arising from the interviews demands an interrogation of the hardware's own potential for co-optation.

As a sociologist and professor in the Department of African American Studies, Ruha Benjamin explains, technological advancements often function as the "New Jim Code," deploying seemingly progressive innovations that secretly reinforce existing racial and economic hierarchies (2019). A machine that extracts cobalt with less ecological harm, yet still channels the economic benefits to the Global North while calming the local workforce, is just a more acceptable version of extractive control. Navigating this sector required a change in the project's main goal: the DFM must ensure the *Oko Ayo* remains actively maintained, as Benjamin describes it, as an "abolitionist tool," where the community's ownership of the infrastructure is prioritized over the machine's mechanical efficiency. Crucially, this requires greater precision than the term's rhetorical power alone can justify. Benjamin's framework demands that a technology actively dismantle, rather than simply reform, the hierarchical structures it operates within. By this standard, the Oko Ayo is more accurately described as an *abolitionist prototype*, a device oriented toward abolition as a design intention, whose abolitionist function is contingent on the surrounding governance structures being transformed. A machine that extracts cobalt humanely, while profits continue to flow through the Toronto Stock Exchange to Global North shareholders, remains embedded in the extractive system it critiques, regardless of its somatic-care features. For the Oko Ayo to fulfill its abolitionist designation, community ownership of the device, the data it generates, and the revenue it produces must all be legally and institutionally secured, conditions this thesis speculates toward but cannot guarantee.

This ethical tension was most clear at the point where the machine and the operator meet. Wearable haptic telemetry and LiDAR scanning are intentionally suggested to support somatic care, aiming to protect artisanal miners from the physical hazards of the pit. Yet, from a historical perspective, this interface exposes a significant risk. Author Simone Browne's foundational work *Dark Matters: On the Surveillance of Blackness* (2015) warns that optics, tracking, and biometrics have historically acted as tools of "racializing surveillance," created to control and police Black labour. Recognizing Browne's critique shows that the success of this speculative technology depends not just on the sensors being perfectly accurate but also on ensuring that its telemetry remains a closed system, thereby giving the miner full digital sovereignty over their somatic data.

7.3 CO-CREATION AND AGENCY

The current version of the Decolonial Foresight Method was developed and tested through a small, focused collaboration — myself, three domain experts, a sound engineer, and a 3D illustrator. The fact that the framework produced a high-fidelity prototype is promising and indicates its conceptual coherence. However, it also highlights an important next step: implementing *Phase 2, Community Foresight,* as the methodology must be tested locally with a much larger and more diverse group of collaborators.

Despite extensive planning to ground this research in the direct testimonies of local artisanal miners, the escalating security crisis in Nigeria's mineral belts made these primary interviews increasingly difficult. I could only secure some images from my colleague on the ground at the mines. This is not an incidental constraint. Military offensives against armed groups in the North-West and North-Central of Nigeria have uncovered not merely camps and weapons but active mining sites, stockpiles of extracted minerals, and logistics chains directly linking resource theft to armed non-state actors, evidence of a fully operational system rather than isolated incidents (Reporters at Large, 2026).

Fig. 39 & 40. Left: *A deep, hand-dug artisanal mining shaft in Ibadan, Oyo, illustrates the precarious infrastructure and physical vulnerability of such sites. Right: A local miner holding a freshly extracted piece of raw mineral ore.*

The structural logic of this system has been confirmed at the highest levels of government: Nigeria's Minister of Solid Minerals, Dele Alake, has stated that illegal miners sponsor banditry and terrorism, while the country's counter-terrorism chief, Major General Adamu Garba, has described illegal mining as intersecting with insurgency, arms trafficking, and cross-border smuggling (AFP, 2025). At the community level, once criminal control of a mining site is established, security analyst Kabir Adamu observes that it becomes a self-sustaining system whose proceeds fund not only weapons but also informants, bribes, and logistics networks that can outlast military operations (Africa Defence Forum, 2025). The physical inaccessibility of these sites is therefore not a methodological failure but a real-time confirmation of this thesis's central argument. The artisanal miners this project seeks to centre have been rendered unreachable by the same extractive violence that demands their labour.

Future implementations should intentionally go beyond the diaspora to include local engineers, environmental scientists, and more involvement from artisanal miners, who have the most direct knowledge of the conditions the framework aims to address. This would better demonstrate design justice, as outlined by Costanza-Chock (2020). A wider coalition would more thoroughly test the method and improve the technical and ecological accuracy of any speculative infrastructure it creates. All three expert consultants are diaspora-based practitioners whose professional expertise, while rigorous and culturally grounded, is spatially distant from the artisanal pits of southwestern Nigeria. Costanza-Chock's framework would rightly interrogate whether a device designed for miners, informed primarily by designers and strategists living in Toronto, has fully escaped the top-down logic it seeks to

dismantle. This structural limitation is shaped by the ethical constraints of conducting fieldwork in active conflict zones, the time and financial constraints of a graduate thesis, and the institutional geography of a Canadian university. Acknowledging it does not diminish the framework's validity, but it establishes a clear ethical obligation for the project's next phase: co-design workshops conducted in situ with active artisanal miners in Ogun and Oyo states, whose embodied knowledge of pit conditions, tool failure, and ecological change represents a form of expertise that no diaspora practitioner, however skilled, can substitute.

Another co-creation dimension this iteration does not adequately address is gender. While global surveys of artisanal mining document a consistent pattern in which women handle ore processing, crushing, and trading roles, and men work the shafts (Hinton et al., 2003), the gender-specific dynamics of cobalt and lithium mining in southwestern Nigeria remain underdocumented in the scholarly literature. What is clear is that the *Oko Ayo* is designed around precise mining and shaft hazards, a choice that carries gendered implications regardless of whether the local pattern exactly mirrors broader regional trends. Hilson's work on West African artisanal mining suggests that shaft-focused technological interventions often concentrate economic gains among male operators while displacing female-dominated processing labour downstream (2003), a risk that warrants direct investigation rather than assumption. Phase 2 co-design workshops must therefore include women engaged in processing and trading as designated participants, both to honour the design justice principle that those affected by a system must shape it and to gather Nigeria-specific gender data, which this iteration was unable to source. The *Oko Ayo's* most significant unresolved design obligation may be one that the existing literature cannot yet fully define.

Reflecting on the creation of the *Oko Ayo* makes it clear that decolonial design cannot happen in isolation; collaboration and co-creation among Africans are essential to shaping our own futures. Engaging with the expert triad, sound designer Siji Olunuga and 3D artist Setonji Hotonu highlighted that the Oko Ayo is not meant to replace the miners' deep-rooted expertise. Instead, by using what digital artist and academic Nettrice Gaskins (2021) calls "techno-vernacular creativity," the device should function as a localized, hackable platform that miners can modify and adapt as they see fit. This project focuses on techno-vernacular innovation to empower artisanal miners to actively shape their industrial future.

Moreover, a thorough decolonial critique must recognize its own material involvement. The immersive technologies used to create and display this high-definition hexapod within a small-scale artisanal mining site are inextricably linked to the global supply chains for cobalt and lithium extraction that this thesis aims to challenge. This also risks reinforcing a "top-down" saviour narrative. Recognizing this serves as a stark reminder that although the

digital artifact suggests a decolonized future, the physical medium remains tied to the extractive present, underscoring the urgent need for decolonial technologies and methodologies such as the DFM.

Furthermore, a truly decolonial artifact must extend its mandate beyond physical hardware to encompass cognitive and economic sovereignty. The user interface and diagnostic displays of the Oko Ayo must fundamentally reject Western, text-heavy paradigms in favour of visual, linguistic, and operational feedback that caters directly to the literacy and established knowledge base of the local artisanal workforce. If the device is to function as an abolitionist tool, its operational language, feedback loops, and physical repairability must be deeply aligned with existing indigenous engineering practices, ensuring the machine can be maintained through local knowledge ecosystems rather than relying on proprietary, imported corporate expertise. Crucially, the telemetry collected by the device — specifically, geological data on soil stability, ecological health, and resource density — must remain highly localized and in a closed loop. Locking this environmental intelligence within a closed community network ensures that the Oko Ayo actively denies the Global North its traditional information asymmetry. This strict data exclusivity shields the miners from external corporate surveillance and transforms the geographic data itself into a protected asset, enabling the local community to leverage their sovereign ecological knowledge to generate complementary streams of income, such as land stewardship consulting, safe-zone contracting, or regenerative agricultural planning.

7.4 THE DFM AS A TRANSFERABLE MODEL FOR DECOLONIAL DESIGN

While the *Oko Ayo* prototype is specifically designed for terrain in southwestern Nigeria and incorporates Yoruba epistemological linguistics, the Decolonial Foresight Method itself is structurally neutral. This methodology offers a highly transferable model for translating diverse cultural epistemologies into hard technological design across various sectors.

The DFM as a replicable methodological structure: **[Indigenous Epistemologies] + Local Foresight + Material Translation = Decolonial Foresight Method → Decolonial Innovation**

This approach sees indigenous or cultural knowledge as a practical engineering or policy constraint rather than just an aesthetic, creating a framework for localized infrastructure worldwide. An example similar to the exploration in this thesis is replacing African (Yoruba) epistemology with the Yanomami principle of Urihi, a view of the forest as a living, interconnected entity (Kopenawa and Albert, 2013). This idea could be applied to the Amazon rainforest, where the technology's design could be inspired by the wings of the

canopy-dwelling Harpy Eagle, Panama's national bird. It could provide a vision for transforming aerial drone networks into community-owned mapping tools and anti-logging deterrents that actively protect indigenous sovereignty and forest biodiversity.

The thesis has tested the DFM's third pillar, material translation, through speculative design and VR prototyping because these tools were appropriate for this iteration's context. It is important to note that speculative design is one instance of material translation, not its definition. The pillar's function is to make the values and strategies produced by the first two pillars tangible, testable, and actionable within the deployment community's specific context. What form that takes should be determined by what the community actually needs, not by the disciplinary conventions of the researcher applying the framework. However, while the DFM's structural neutrality suggests broad applicability, its transferability at this stage is propositional rather than demonstrated. The framework has been stress-tested against one cultural epistemology, one geographic context, and one industrial sector. A more rigorous validation would require parallel applications to determine whether the three-pillar structure holds across diverse epistemological and material conditions. This thesis offers the methodology; its transferability must be confirmed through iterative application by future research.

Nonetheless, while existing frameworks share philosophical common ground with the DFM, none combine its three pillars into a single, sequential, and empirically tested methodology. Arturo Escobar's autonomous design framework in *Designs for the Pluriverse* (2018) operates primarily at the philosophical level and does not provide a structured process for converting cultural values into testable engineering specifications. Dr. Dori Tunstall's *Decolonizing Design* (2023) remains institutionally rather than project-focused. Most directly, Mohamed et al.'s *Decolonial AI* (2020) explicitly calls for new methodologies that enable marginalized communities to meaningfully influence technological decision-making, a call the DFM is designed to answer. What distinguishes this framework from its predecessors is the inclusion of Local Foresight as a formal middle pillar: a structured conversion layer that transforms Africanfuturist epistemological values into concrete engineering specifications through participatory expert interviews. Other frameworks seem to move directly from cultural orientation to design output; the DFM inserts a strategic translation mechanism between them, and then tests that mechanism against a real-life problem, producing a tangible prototype as evidence of its operational coherence. It is this combination — epistemological grounding, strategic foresight, and material translation, executed in sequence — that positions the DFM as a methodological contribution to the field rather than a philosophical restatement of principles already established by others.

Furthermore, while the title and creative outputs of this thesis focus on the future of African technology, it is important to distinguish between the scope of this iteration and the broader potential of the methodology itself. The DFM is not solely a technological plan; rather, it is a structural approach for decolonial innovation, with the *Oko Ayo* spatial computing prototype serving as one example of a completed result.

This iteration further demonstrates the DFM as a proof of concept for community-sovereign infrastructure governance. The agricultural dual-use mandate encodes community benefit as an operational condition of the machine rather than a voluntary CSR commitment. The closed-loop mesh network enforces data sovereignty by technical design rather than contractual promise. The LED interface makes critical environmental intelligence legible to the community without requiring corporate mediation. Their cumulative effect is that a company wishing to access the geological and agricultural intelligence the *Oko Ayo* generates cannot do so without the community's active participation, because the device's architecture makes extraction of that intelligence technically impossible without it. This inverts the conventional relationship between extractive capital and host communities. Rather than communities petitioning companies for benefit-sharing, companies require community cooperation to access the informational value of the land. It is this inversion, governance embedded in device architecture before and independent of any legal or contractual framework, that constitutes the DFM's most significant methodological claim.

Although this thesis introduces the DFM in its initial form, tested against one cultural epistemology and one industrial sector, a detailed operational protocol is available and could be published in future work.

7.5 EXHIBITIONS AND DIASPORIC ENGAGEMENT

Building on a foundation in psychological theories and lens-based cinematic storytelling, the move into spatial computing posed challenges for emotional and spatial accountability. The VR documentary is a navigable, psychologically rooted proof of concept. Yet a decolonial artifact fails in its purpose if it remains trapped within the institutional confines of a university archive.

To truly democratize the experience of the virtual terrain, the VR documentary should be presented as a public, spatial exhibition. Museum displays provide an important space, turning the solitary act of wearing a VR headset into a shared, discussion-based event. The exhibition strategy must target the physical intersections of the diaspora to effectively reach the stakeholders who most urgently need to engage with this framework. Installing the experience in civic spaces and museums within Toronto, a global epicentre for mining

finance (Deneault and Sacher, 2012), forces the architecture of Western capital to confront a fully realized decolonial alternative.

Finally, while the Decolonial Foresight Method has a transformative potential that extends far beyond this virtual space, it remains fundamentally a speculative exploration. Its main goal is to create a protected mental space for Africanfuturists to dream: to imagine realities unburdened by the trauma of the present. However, by translating these speculative visions into practical design frameworks, it bridges the gap between imagination and tangible engineering, offering concrete, actionable solutions directly for the continent.

Offered as a contribution to the ongoing critique of Western extractive capitalism, this framework seeks to challenge dominant narratives of technological innovation and propose a vital shift in perspective for the Global South and its diaspora. It represents a hopeful step toward empowering marginalized communities to transition from being subjects of extraction to active architects of their own industrial sovereignty. This thesis seeks to demonstrate that high technology is not strictly bound to the continuation of colonialism. When guided by cultural epistemologies, local foresight, and critical fabulation, the radical act of dreaming can transcend mere speculation or just an escape from present realities. Instead, the DFM is offered not as a finished system but as a replicable methodology, one that has demonstrated, through a working prototype, that the radical act of dreaming can become a practical act of engineering our lasting technological liberation.

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APPENDICES

APPENDIX A: SCRIPTS

Prologue

Narration

“This is southwestern Nigeria, a region once characterized by harsh extraction, which is now managed with care and respect. This site demonstrates the potential outcomes when government policy, local leadership, and Africanfuturist design are integrated.

This is where the Oko Ayo, the Vessel of Joy, is virtually implemented. Before exploring the device, take a moment to observe your surroundings. As you move through the site, you will encounter the concepts that informed this design. There will be a central monument that honours those who lost their lives to the extractive violence, a key motivation for this project. We invite you to spare a minute there, reflect, and then continue envisioning and embodying the future of ethical infrastructure.”

Monument reflection

“This piece is dedicated to honouring the lives lost to the extractive violence of artisanal mining. Please take a moment to pay your respects to the labourers whose enduring realities inspired this intervention."

Epilogue

Narration

“As you prepare to leave this virtual environment, we ask you to consider the implications of this framework in the real world. Remember that the headset you are wearing, the technology enabling this experience, is directly connected to the land and to the hands of the artisanal miners whose realities inspired this intervention.

This future of ethical infrastructure is a blueprint we invite you to help construct.**”**

SHORT DOCUMENTARY SCRIPT

[0:00 - 0:45] THE PROBLEM

"The devices we use every day, our smartphones, our electric vehicles, the very screens we look at, are powered by the earth, specifically, by the relentless extraction of cobalt and lithium.

But the supply chain linking these technologies is broken by violence. In the artisanal mining pits of southwestern Nigeria, marginalized workers operate under extremely dangerous conditions. Today, this extraction has grown into a self-sustaining conflict economy, where

armed non-state actors take control of remote sites, forcing local communities into a situation torn between the threat of violence and the heavy demands of global corporations.

Much of this demand is coordinated from financial centers in the Global North, such as Toronto, the hub of global mining finance. We are presently caught in a cycle of extractive violence. But what if we could use speculative design to alter the technological systems that govern it intentionally?"

[0:45 - 1:30] THE METHODOLOGY

"This project, *Beyond Speculation*, proposes a radical alternative: The Decolonial Foresight Method.

It transitions Africanfuturism from a literary genre into a tangible blueprint for decolonial technological innovation in Africa. By synthesizing African epistemologies, local foresight, and speculative design, we ask a new question: What does a decolonial mining infrastructure actually look like?

Through collaborative interviews with diasporic experts in physical computing, wearable technology, and 3D architecture, we visualized a framework that rejects Western corporate efficiency. Instead, we prioritized 'somatic care' to protect the land and miners' physical health, as well as strict data sovereignty, to ensure the technology serves the local community first.

[1:30 - 2:15] THE VR EXPERIENCE

"The culmination of this research is a Virtual Reality documentary that transports users to a speculative, restorative mining site.

Here, we encounter the *Oko Ayo*, the 'Vessel of Joy.' This biomimetic, spider-like hexapod is designed more as a sovereign system for overall ecological stewardship than just an extractive tool, which is congruent with African cultural values.

Its interface relies on a localized, visual dashboard that communicates directly with the miners. It would track soil stability and resource density, but would lock this intelligence within a closed community network. It would also actively deny foreign corporations their traditional asymmetry of information, transforming ecological data into a protected, local asset."

[2:15 - 3:00] THE CALL TO ACTION

"Within the virtual site, a central monument stands to honour the lives lost to the extractive violence that inspired this intervention. It is a place for reflection.

But ultimately, the *Oko Ayo* is more than a digital simulation; it is a provocation. The Decolonial Foresight Method demonstrates that high technology need not serve as an instrument of colonial continuity. When guided by local foresight and critical fabulation, the tools of the future can be fully reclaimed. We invite you to join us in this shift—to move beyond speculation, and actively engineer the infrastructure for lasting technological liberation of the Global South."

APPENDIX B: INTERVIEW QUESTIONS

Interview questions

Interviewee: Tolu Olowofoyeku

Researcher: Peter Oke, Digital Futures

Objective: To gather insights on creative methods, speculative approaches, and design principles that can guide technology development for ethical mining in Nigeria.

Duration: ~60 minutes

Introduction

- Explain the research purpose.
- Confirm consent for recording.
- Clarify that the goal is to develop a speculative design concept for ethical cobalt mining in Nigeria.

Warm-up Questions

1. Can you describe your background and experience in speculative design?
2. How do you approach combining theory and practice in speculative design projects?
3. What are your views on using speculative design to tackle social and ethical issues?

Sector-Specific Questions

4. What methods or frameworks do you recommend for designing technology with ethical and social impact?
5. How do you integrate local cultural, social, and environmental contexts into speculative design projects?
6. Can you provide examples of speculative design projects that successfully influenced real-world practices?

Creative & Speculative Questions

7. If tasked with designing a technology to support ethical cobalt mining, what design principles would you prioritize?
8. How could immersive experiences (VR, AR, simulations) help visualize ethical mining futures for stakeholders?

9. How do you balance speculative creativity with technical feasibility and local constraints?

10. What design features or prototypes could make abstract ethical concepts actionable in mining technologies?

Closing Questions

11. Are there specific speculative techniques that could enhance collaboration between tech developers, miners, and local communities?

12. Any additional creative strategies or recommendations for shaping a technology to promote ethical mining practices in Nigeria?

Interview questions

Interviewee: Patricia Mwenda

Researcher: Peter Oke, Digital Futures

Objective: To translate the principles of "wearable care" into "industrial stewardship," specifically defining the operator interface for the VR mining device.

Duration: ~60 minutes

Introduction

- Explain the research purpose.
- Confirm consent to record and use data.
- Clarify that insights may be used to inform a speculative design concept for ethical cobalt mining.

Contextual Bridge

This research moves the Africanfuturist lens from your focus on **somatic/personal healing** (wearables) to **ecological/industrial healing** (mining).

A 'Spider' (Hexapod) form factor, based on advice from Tolu Olowofoyeku (Disney+ IWAJU), has been adopted for the device's shape. Now, I need your expertise in physical computing to determine how a human operator connects to this machine.

Creative & Speculative Questions

Sensing the Land

Your *Moyo Monitor* used sensors to track the wearer's heart rate and anxiety levels to facilitate healing. If we view the **Earth** as the patient and the **Spider Bot** as the diagnostic tool:

1. How would you suggest the miner controls the device?
2. What kind of 'vitals' should this machine be sensing in the cobalt?
3. Instead of just detecting 'ore density' (extraction), what sensor data would signal that the machine is *caring* for the soil stability?"
4. If you were designing a technology to ensure ethical cobalt mining, what features or capabilities would you prioritize?
5. How could digital tools (e.g., data tracking, immersive simulations) be used to monitor and improve labour and environmental practices in mines?
6. Are there design approaches or technological frameworks you'd recommend to bridge theory with practice in this context?

Closing Questions

7. As this device is an activist proposition against the exploitation of cobalt miners, what is the **single most important function** it must perform to prove that the miner's life is valuable?"
8. Do you have any other suggestions or insights that could inform the development of a technology to aid ethical cobalt mining?

Interview questions

Interviewee: Yaw Sakordie

Researcher: Peter Oke, Digital Futures

Objective: To translate the principles of "data sovereignty" into industrial stewardship, specifically defining the data architecture and diagnostic interface of the VR mining device.

Duration: ~60 minutes

Introduction

- Explain the research purpose.
- Confirm consent to record and use data.
- Clarify that insights may be used to inform a speculative design concept for ethical cobalt mining.

Contextual Bridge

Since our initial conceptual discussions, the physical and somatic form of the device has crystallized based on the collaborative insights of our expert triad:

• From Tolu Olowofoyeku, we adopted the biomimetic "Spider" (Hexapod) form factor to navigate the terrain without destroying the soil and ethical labour surveillance.

• From Patricia Mwenda, we established the operator interface: a wearable haptic telemetry suit focused on somatic care to protect the miner's physical body and monitor structural stability.

• Now, I need your expertise in Foresight and data sovereignty to define the digital "nervous system" of this operation. We have the body (Tolu) and the human connection (Patricia); now we need to secure the data.

Creative & Speculative Questions

Data Architecture & Sovereignty

1. In our discussion, you mentioned that the device has to function as more than a mining device. Can you expand on this?
2. Patricia's framework relies on biometric sensors and LiDAR to protect the miner from pit collapses. However, tracking Black bodies in a labour environment risks becoming racialized surveillance. How do we architect the software of this device so that this telemetry remains a closed-loop system of care, rather than a data-mining tool for corporate clouds?
3. If we refuse to send the speculative device's environmental and biometric data to a centralized server in the Global North, how should the machine physically display this information back to the artisanal miners?
4. What should an outward-facing, community-owned UI look like in the pit?

Closing Questions

5. As this device is an activist proposition against the exploitation of cobalt miners, what is the single most important function its data network must perform to prove that the miners' lives and their sovereign knowledge are valuable?
6. Do you have any other suggestions, insights, or structural recommendations to inform the final visualization of this localized digital infrastructure in VR?

APPENDIX C: COLLABORATIONS

Expert Consultant (Speculative & Cultural Design): Tolu Olowofoyeku
Expert Consultant (Wearable Technology & Somatic Care) & Volumetric Subject: Patricia Mwenda
Expert Consultant (Local Foresight) & Volumetric Subject: Yaw Sarkodie
3D Architect & Concept Modeller (*Oko Ayo*): Setonji Hotonu
Sound Design for VR Experience: Siji Olunuga

APPENDIX D: VIRTUAL REALITY ASSETS

Book of the Dead: Environment by Unity Technologies
Boulder 01 by Rico Cilliers
Translucent Crystals by SineVFX
Wind Turbine Animated by VIS Games
High Quality Solar Panel by Padia 3D
Terrain Sample Asset Pack by Unity Technologies
AllSky Free - 10 Sky / Skybox Set by Unity Technologies