Future Art Ecosystems

Vol 2. Art x Metaverse

Produced by

 Postface: Bettina Korek and Hans Ulrich Obrist ——————— 117

Contributor & Advisor Biographies ——————————— 121
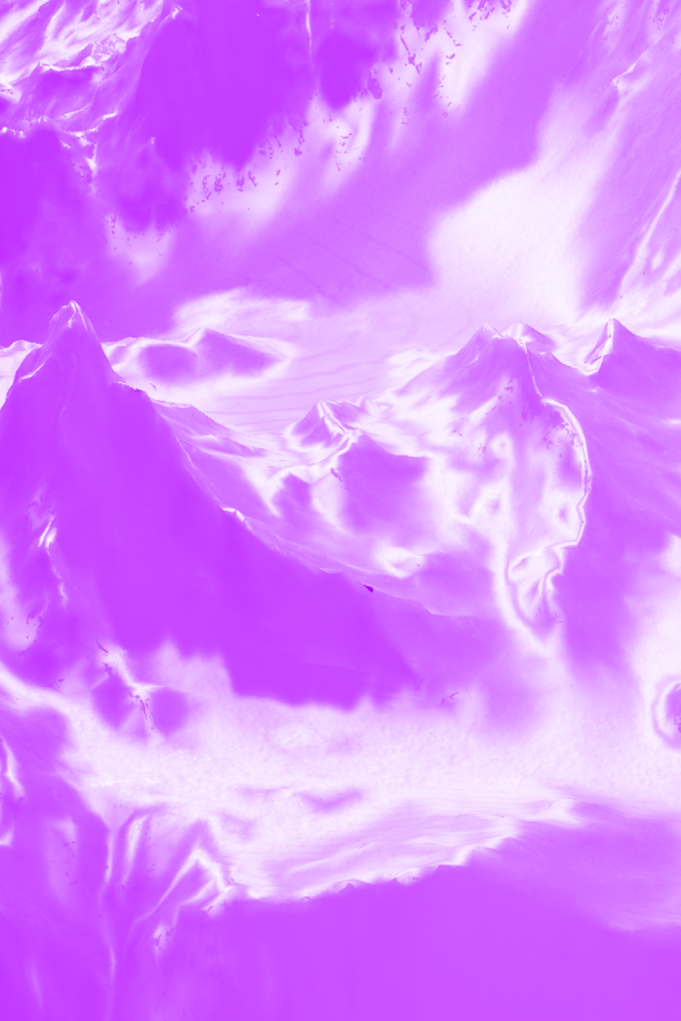
Preface

What we know today as 'the internet'
has historically been accompanied by a
particular class of high-definition visions
for its future. In this luminous world, a
boundless 3D ⊕ space, digital beings would
interact through new forms of collectivity
and partake in new modes of making,
sharing, learning and trading.

The idea of the *metaverse*—broadly defined
as an always-online and persistent ⚬ spatial
⊕ virtual world—is being resurrected through
a fundamental shift in digital infrastructure.
This development includes the relatively

recent advent of consumer-level technologies such as video game engines and immersive hardware, and is accelerated by a bearing within the games industry towards user-created ✦ worlds.[1] At present, the metaverse is set to be shaped mainly by the interests of large corporations and mass markets. How and why should cultural institutions engage with the construction of the metaverse? And for whose benefit?

The purpose of Future Art Ecosystems (FAE) is to provide analytical and conceptual tools and strategic guidance for the construction of 21st-century cultural infrastructure: the systems that would support art and advanced technologies as a whole, and be responsive to a broader societal agenda.[2]

5

Future Art Ecosystems: Art x Advanced Technologies (FAE1) was published soon after coronavirus (COVID-19) was declared a global pandemic by the World Health Organisation on 11 March 2020. The inaugural strategic briefing addressed the implications

of artistic engagements with advanced technologies in terms of the infrastructural redesign that they enable within, and in parallel to, existing art ecosystems.[3] FAE1 surveyed a number of *infrastructural plays* —attempts to build social, financial, presentational and other forms of infrastructure for creative work—and specified a series of strategies to link them together into new ecosystems. Two of these strategies had been spreading through the art industry with increasing velocity: the tech industry operating as an art patron, and the development of vertically integrated studios—*art stacks* that cut out many of the conventional aspects of the art industry.[4] However, a cultural infrastructure for the 21st-century—a technologically sophisticated, experimental and highly interoperable ecosystem of organisations and capabilities —remains to be built.

This second volume of Future Art Ecosystems: Art x Metaverse (FAE2) picks up where the first left off, after public cultural institutions around the world found themselves forced to 'go virtual' in new ways. Engaging with

Preface

6

over fifty practitioners and organisations across art, film, gaming, technology and wider cultural industries, FAE2 articulates the challenges and opportunities that cultural institutions face in this landscape. We thank all those who shared ⠌ their views and insights as contributors. Additional insight was drawn from FAE-sponsored roundtables led by Lucy Rose Sollitt and Jay-Ann Lopez, who curated and facilitated discussions on metaverse and cultural institutional space, and metaverse and gaming, respectively.

The core team responsible for the production of FAE2 includes Serpentine R&D Platform (Alex Boyes, Tamar Clarke-Brown, Victoria Ivanova, Eva Jäger, Ben Vickers and Kay Watson), Rival Strategy (Marta Ferreira de Sá and Benedict Singleton) and guest producer Luke Caspar Pearson, co-founder of You+Pea, Programme Director BSc Architecture at the Bartlett, UCL, and Lecturer in Videogame Urbanism.

as well as The Royal Parks for their ongoing support. The public funding that Serpentine receives through Arts Council England provides an essential contribution towards all of the organisation's work and Serpentine remains grateful for this continued commitment. We would also like to thank Arts Council England and the Department for Digital, Culture, Media and Sport for their support through the Culture Recovery Fund.

The Council of the Serpentine is an extraordinary group of individuals that provides ongoing assistance to deliver its ambitious programmes. We are sincerely appreciative, too, for the support from our Corporate Partners, Americas Foundation, Patrons, Future Contemporaries and Benefactors.

Preface

9

Notes 1-4

1. Leading metaverse companies such as Epic and
   (p.5) Roblox have explicitly carved out a vision in which
   the metaverse is driven by user-created ✢ content,
   similar to YouTube's user-driven ✢ video streaming.
   From the Roblox IPO filing: 'Roblox is a vast and
   expanding universe of developer and creator-built
   content. As of September 30, 2020, there were over
   18 million experiences on Roblox'.
   Link: https://bit.ly/3gf7zkJ

2. In the context of art and technology, 'broad societal
   (p.5) agenda' is coextensive with the existence of publicly
   governed infrastructure that has a high degree of
   transparency in its construction and coordination.

3. Advanced technologies include emerging technologies
   (p.6) and more established technologies whose long-term
   implications are still largely unknown.

4. Since publication in July 2020, a number of new art
   (p.6) stacks emerged including Superblue and Van Gogh:
   The Immersive Experience.
   Links: https://bit.ly/3giqPhm and https://bit.ly/3zldNHk

Image credit: P.1-2 *Snow Mountain* by 3d_molier
International on TurboSquid, 3D Model License
(Standard) Link: https://bit.ly/2SK1ynf

13

There are over a million people watching a
Twitch live stream at any given second.
People in the cultural arts space don't know
about it; and the people on Twitch don't care.
Amelia Winger-Bearskin

Introduction

Since March 2020, repeated lockdowns and restrictions on physical experience resulting from the global health emergency required cultural organisations to turn to digital space as the primary arena for fulfilling their missions of serving the general public. Yet competing for significant online engagement of audiences within an attention economy ✦ that includes the likes of Netflix, 24-hour news cycles, Reddit and AAA gaming proved to be an immense challenge. This predicament was by no means novel but only made starker by the absence of physical programming that had been at the centre of cultural institutional digital strategy.

14

Promotion on digital + social media platforms to engage *followers*

Drive *visitors* on site

Physical space

Editorial content to engage *readers*, *listeners*, *viewers*

Events programme to engage *viewers + listeners*
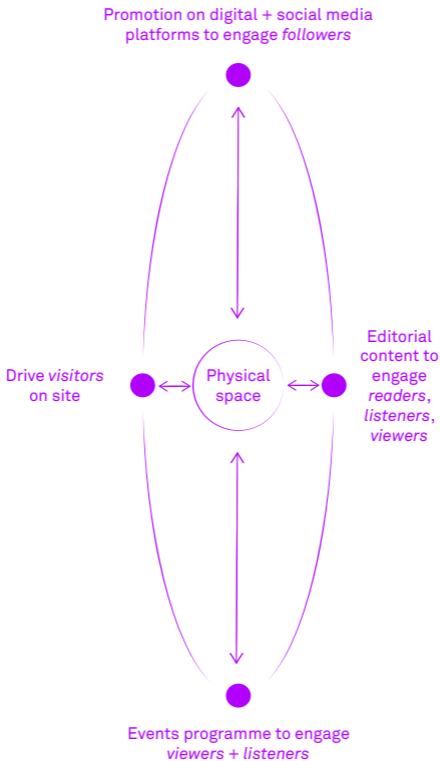
Orientation of digital strategy at cultural institutions before COVID-19

Promotion on digital + social media platforms to engage *followers*

Editorial content to engage *readers*, *listeners*, *viewers*

Drive *visitors* on site

Physical space

Events programme to engage *viewers + listeners*

Disorientation of digital strategy at cultural institutions during COVID-19
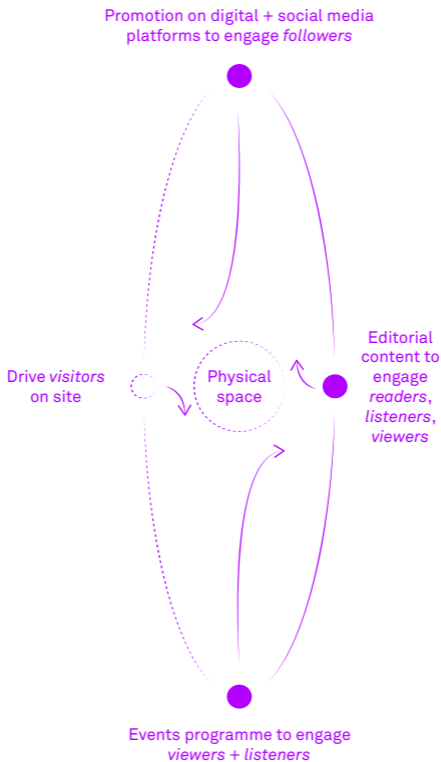
Meanwhile, *advanced virtual environments* have been emerging as key sites for social and cultural experiences that structure and facilitate conversations, creative projects, collective endeavours and trade. The video games industry is frontlining in this sphere, having spent decades developing, prototyping and operationalising the technologies for the creation of hybrid ◉ digital-physical experiences that involve bodily interaction and avatars; digital spatial ⊕ experiences that are seemingly unlimited in scale and imagination; and facilitation of multi-party, real-time ✳ interactions with other users ✳

and the digital environment.[5] Game technologies are becoming the fundamental infrastructure for the metaverse—an ecosystem of virtual worlds that is likely to transform the internet and may become the gateway to a spatial ⊕ web.[6]

17

The 'metaverse' is a term from cyberpunk and sci-fi literature of the 1990s exploring the utopian/dystopian potential of the encroaching web, and which captures the

emergence of increasingly complex virtual worlds and hybrid ☺ experiences. It also functions as a narrative device facilitating investment into the metaverse stack and the companies and organisations that are driving this long-term vision.[7]

Game technologies' capacity to underwrite virtual production is also leading to their widespread adoption across a number of fields, including architecture, urban planning and industrial manufacturing. By contrast, cultural institutional engagement with advanced virtual environments and their underlying technologies is currently sparse and ad hoc, despite the construction of virtual worlds syncing closely with the interests and jurisdiction of organisations historically dedicated to providing an experiential-conceptual interface between art and culture, and the general public. FAE2 points to the areas that would need to be addressed operationally for cultural institutions to determine their role and stake in the metaverse.

As advanced virtual environments become increasingly ubiquitous, Chapter 1 explores *user experience of art* (UXA) as a strategic model for reassessing the key touchstones of cultural institutions' digital strategy. Chapter 2 surveys the emergence of 'metaverse-native' art in *art-adjacent fields* such as gaming, blockchain, film and architecture as a consequence of their openness to developing new skills, proficiencies and business models around emerging technologies. While FAE2 does not suggest that indie games, immersive storytelling or crypto-art should be absorbed as 'promising' artforms into an existing art-institutional ecosystem, there is plenty that cultural institutions can learn from gaming and art-adjacent fields in adapting digital strategies for a post-pandemic world.[8]

19

As a planetary-scale infrastructural project, the metaverse's greatest challenge to cultural institutions is in terms of their role as public interest organisations. Cultural institutions can only continue to fulfil this role if they are advocating for and contributing to the

construction of an open and accountable *21st-century cultural infrastructure*. Chapter 3 proposes a set of vectors for a sector-wide effort to take active steps in that direction.

Cultural institutions had to adapt their programmes in response to the pandemic and pivot to digital. This is something they probably should have been doing a decade ago to reach audiences, but they need the infrastructure and skills to create meaningful long-term digital experiences.
Dr Jo Twist OBE

Notes 5-8

5.
p.17
Senior figures in the games industry have been signalling towards the potential of game technologies as the infrastructure of the future, most notably Herman Narula, CEO of Improbable, and Tim Sweeney, CEO of Epic Games.

Narula: 'Video games are that unassuming idea that will change how we operate'.
Link: https://bit.ly/35dUNN6

Sweeney: 'Metaverse is going to be some sort of real-time 3D social medium where instead of sending messages and pictures to each other asynchronously, you're together with each other in a virtual world'.
Link: https://bit.ly/3q7dJXp

6.
p.17
The term 'metaverse' was coined by writer Neal Stephenson in his sci-fi novel *Snow Crash* (New York: Bantam, 1992). Aside from 'metaverse', the terms 'Mirror Worlds', 'spatial computing', 'web 3.0', 'multiverse', 'immersive internet' and 'Magicverse' derive from academic, literary and commercial contexts, and are all associated with technological narratives around the emergence of spatial web.

7.
p.18
For example, see Matthew Ball's 'The Metaverse: What It Is, Where to Find it, Who Will Build It, and Fortnite'. Link: https://bit.ly/3xjovMF

21

8.	While exhibitions such as *Video Games: Design/Play/Disrupt* (London: V&A, 2018-19) and *States of Play: Roleplay Reality* (Liverpool: FACT, 2018) have been significant in opening up the potential of video games as cultural forms to art audiences, the focus of FAE2 is on systems and infrastructures.

Image credit: P.11-12 *Snow Mountain* by 3d_molier International on TurboSquid, 3D Model License (Standard). Link: https://bit.ly/2SK1ynf

Notes 5-8

22
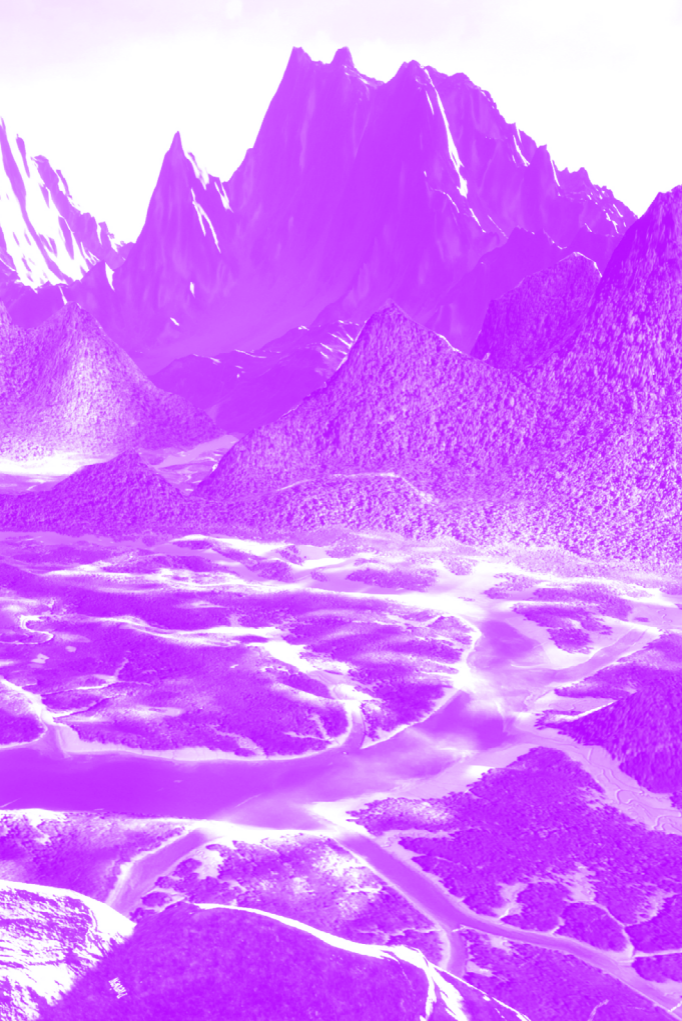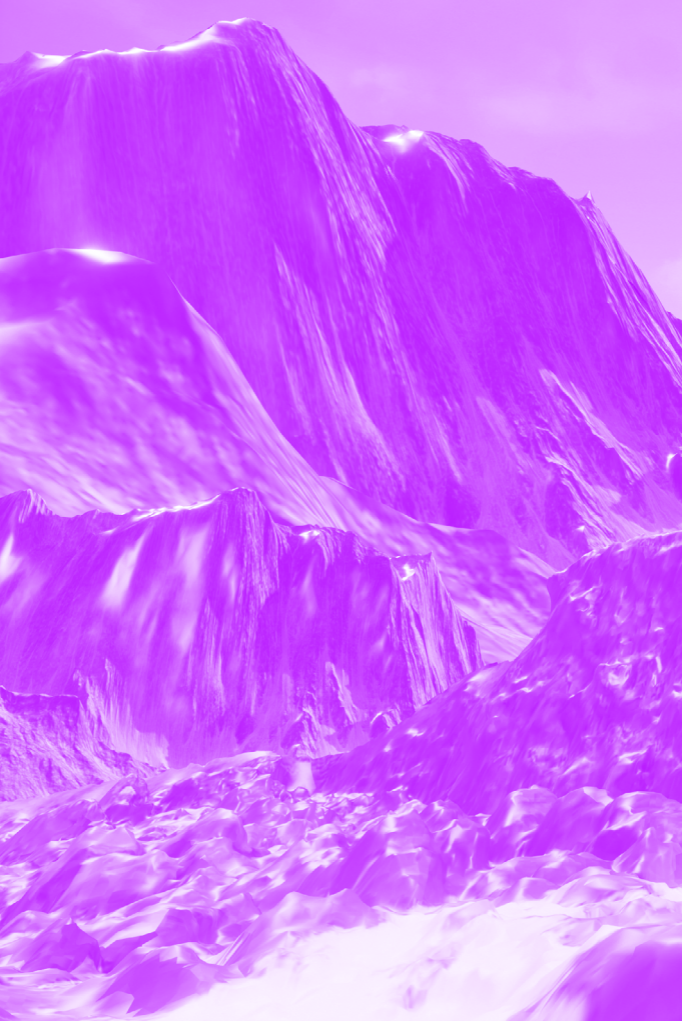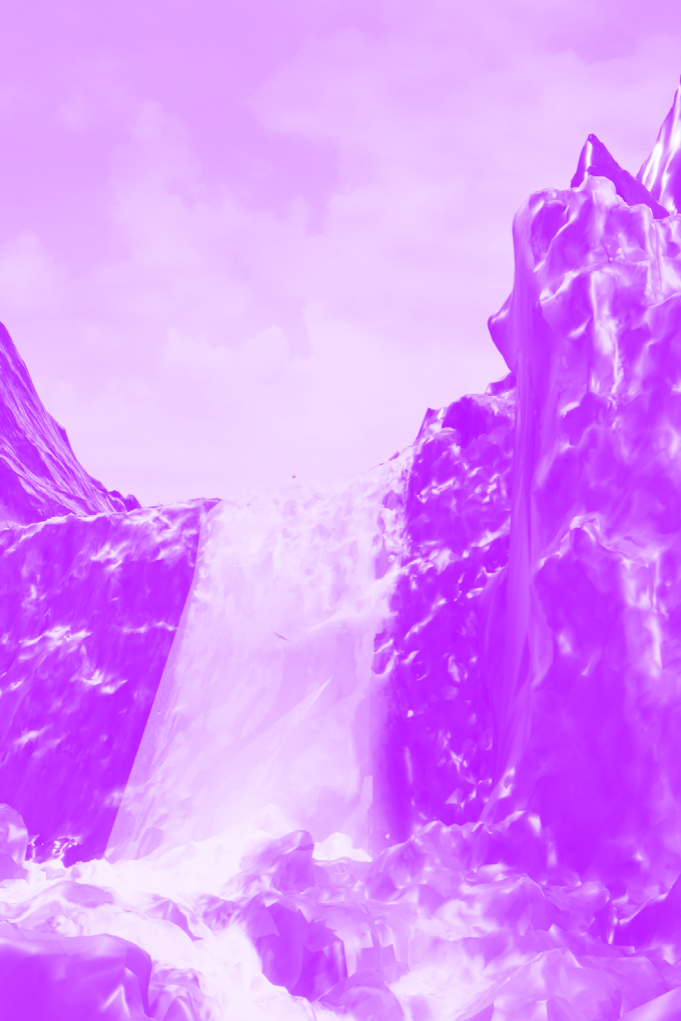
For the 'zoomer' generation it is common practice to be able to build, change and shape the virtual environment around them.
Jay Springett

1

UX of Art

UX of Art

28

White Cube Model vs Advanced Virtual Environments

Historically, public cultural institutions have been built around a physical space in which people are exposed to the ideas and creativity of others.[9] The white cube model (WCM) has functioned since the 1960s as the de facto framework for the display of art and precious artefacts for the general public.[10] To this day, the WCM's embedded spatial ⊕ and operational principles determine how most cultural institutions organise their broader strategies:

1. *Presented objects are unique and finalised*

2. *These objects are presented to a general anonymous viewership*

3. *A specially configured physical space is the hosting environment of the presented objects ('artworks')*[11]

The WCM is the *presentation system* for an institutional and economic ⚲ model that relies on consecrating art or artefacts as unique (or very scarce) precious objects; the WCM's value lies in providing access to these objects.[12] While the presence of viewers is important, at least insofar as the magnitude of viewership (i.e. footfall) is correlated to the magnitude of demand (i.e. 'cultural significance'), there is a sharp contrast between the emphasised uniqueness of 'the work' and the fungible nature of imagined spectators.

Despite various deviations from the WCM over the last fifty-plus years, cultural institutions continue to see themselves as spaces that audiences must enter in order to encounter art.[13] The advent of the internet, and in particular web 2.0 (the 'social web'), has significantly challenged these established ideas around how art can be accessed and experienced, whether it is through YouTube and Vimeo, or dedicated artistic platforms such as DeviantArt and Contemporary Art Daily.[14] The inception of advanced virtual

environments—digitally produced 3D ✛
spaces—that can be accessed via VR
headsets, AR applications, game consoles
or a browser, further entrenches
these challenges.

When Kanye West released an album, and
then a week later released another version of
it, it made so much sense. You're not pressing
a CD or vinyl and then shipping. The opportunity
to always improve something is very much in
the world of tech. It's just second nature. You
can always push a new build.
Veronica So

Currently, the most sophisticated advanced virtual environments can be found in video games, ranging from niche independent titles to Massively Multiplayer Online (MMO) worlds, as well as any other virtual experience that is built with game technologies.[15][16] At the same time, greater integration of digital infrastructure and experiences into all spheres of life means that advanced virtual environments are not sealed-off worlds with their own rules; rather, their logics infiltrate and enmesh with all aspects of social, cultural and economic interaction, whether online or offline. There are certain features of interactions with and within advanced virtual environments that are increasingly becoming wider cultural norms:

1. *Presented experiences are unique but open to iterative change*

The boundaries of digitally produced 'objects' are more fluid, not only in terms of the possibility of multiple, evolving iterations, but also with respect to how these objects transform with context and user ⊹ interaction. As a result, the focus of advanced virtual environments is on experience as a unique

UX of Art

32

process of discovery and interaction, as is evident in game worlds, where moving through an environment allows one to become familiar with its various objects and structures from a number of perspectives.

2. *Interaction motivates sustained engagement with an advanced virtual environment*

Advanced virtual environments enable modes of agency characterised by active engagement rather than passive spectatorship.

While the majority of cultural institutions remain most familiar with broadcast and light-touch participation models, gaming deploys a number of different engagement formats. For example, unlike an exhibition opening, which is usually discrete and limited by geography, the release of a new game could involve: consultation with player communities to build the audience for that game through user-testing ⁕; discussions on Discord or Twitch communities facilitated

by community managers; or cultivating sustained engagement through the constant cycle of releases, feedback and software updates.

In turn, game-world logics for cooperation and sociality find their forms in guilds and clans. Users ✛ are incentivised to keep returning to the game by drops, raids and in-game interactions that provide opportunities for action and interaction with others in an environment that is both familiar and constantly evolving.[17][18][19]

34

If you don't touch the controller, nothing's going to happen. You, the player, are at the centre of everything.
Yarden Yaroshevski

3.   *Experiences are framed by virtual worlds but extend beyond them* [20]

Advanced virtual environments are discoverable and layered inhabitable spaces. The narrative power of such a world has the productive capacity to extend its story beyond its virtual confines through user-created ⊹ content and narrative extensions into other spheres, platforms and contexts.

UX of Art: A Strategic Approach to an Increasingly Hybrid Reality

Today, the layers of digital persistence, intervention and transaction are part of reality. I think we're beyond the point where you plant something on your head, or you plug something in, and call that 'digital'.
Natalie Kane

There is a striking dissonance between the experiential expectations of advanced virtual environments and the object-focused methodologies of WCM, particularly when 'digital strategy' either serves to mirror gallery-sited approaches to space, and/or to amplify the activity happening within physical galleries through digital marketing. In the UK, the onset of 'digital transformation' in the cultural field has primarily focused on implementing digital tools to 'allow arts organisations to better do the things that they have been doing all along.'[21] [22]

p.51

This has meant that responsibility for digital presence and strategy has generally fallen within the remit of marketing and communications departments, or digital departments modelled in their image, tasked with bringing in audiences to exhibitions, performances and events happening inside physical buildings, while making larger online audiences aware of, liking and sharing information on curated programmes. 'Digital' became synonymous with accessibility and reaching greater audiences to experience events designed for physical spaces (e.g. via

streaming) or gallery-confined artefacts (e.g. via digitising collections).[23]

The eventual emergence of the 'digital curator' position in some institutions functioned as an institutional acknowledgment of the limitations of such mirroring or amplification approaches to 'digital strategy' and their failure to address virtual space as a site or digital technologies as mediums of cultural production that offer novel ways of organising engagement and economic activity.[24][25] However, due to the established organisational partitioning between 'gallery-side' activities and backstage systems, the potential of the digital curator role to widen the scope of digital strategy and shift away from WCM principles as its central referents was highly circumscribed.[26]

A shift in organisational thinking away from the restrictive binary of physical-digital requires a holistic approach whereby all of the organisation's functions beyond presenting works of art to the public come

under one lens.[27] Depending on the organisation, these may extend to commissioning, collecting, preserving, documenting and financialising art. These processes involve a number of internal and external stakeholders. Understanding the institution as a platform that brings together multiple stakeholder groups in order to facilitate the various processes related to the experience of art offers an organisation-specific touchstone for crafting strategies and prioritising investments.

What is proposed as *the user experience* ✛ *of art* (UXA) offers such an approach. 'User experience' (UX) ✛ is a term derived from human-computer interaction in the 1990s (the latter being an offshoot of cybernetics and ergonomics), which was initially concerned with user interfaces ✛, and the layout of information so that an interface is 'intuitive' to use. 'UX' has since become a common term within design, used to describe all the aspects of experience that arise from interactions with an object or a system over time, including non-digital interactions. Much of what cultural

institutions *do* is provide the contextualising frame in which people encounter creative works, and UX is how this role is understood elsewhere.[28] Good UX thinks through how the logics of space, content, audience and navigation come together in meaningful ways, and it is through this that a channel-agnostic revision of the cultural institution can take shape. If UXA provides an expanded frame in which to understand the cultural institution's relation to advanced virtual environments, what are the tenets of such a user experience ✛?

——— ✦ ———

1. *UX of art focuses on art experience rather than the artwork as a rare object*

In the UK, some of the leading cultural sector innovators in the area of advanced virtual experiences are big performing arts organisa-tions such as the Royal Shakespeare Company, Royal Opera House and National Theatre. In 2021, *Dream*, an interactive symphonic virtual experience based on William Shakespeare's *A Midsummer Night's Dream*, and *Current,*

Rising, a multi-sensory hyperreality opera experience, set important benchmarks.[29] Performance could be seen as a particularly adaptive medium since it is intrinsically focused on temporal durational experience.[30]

By contrast, within the visual arts, the Online Viewing Room—a 3D ⊕ walk-through digital white cube—emerged during the pandemic as a new quasi-industry standard, replicating a very narrow approach to the wealth of possibilities offered by advanced virtual environments.[31] However, it would be short-sighted to see such a lack of ambition as a by-product of visual art per se. More experimental art experiences of the pandemic period, such as SPUR and the launch of Manchester International Festival's Virtual Factory in *Fortnite*, were more innovative. Not only did they reconfigure art objects into art experiences, but they also rethought what one might expect from a curator and what additional roles might be required to make such experiences a reality, including technical production and community management.[32]

White Cube Model

UX of Art

Presented objects are unique and finalised

UX of art focuses on art experience rather than the artwork as a rare object

These objects are presented to a general anonymous viewership

UX of art implies that any institution has a range of specifiable types of user rather than the 'general public'

A specially configured physical space is the hosting environment of the presented objects ('artworks')

UX of art allows for cultural institutions to develop a deeper integration with artistic production processes

UX of art implies that any institution has a range of specifiable types of user rather than the 'general public'

The concept of 'users' ✧ enables the expansion of the stakeholder base beyond the generic catch-all category of 'general public' (i.e. viewers). This reframing also facilitates the articulation of how contemporary cultural institutions may in fact have multiple 'user ✧ groups' that may change over time, and some of which may be specific to a particular organisation and even streams within an organisation. Perceiving these groups as 'users' ✧ also enables institutions to rethink the wider exchange of value within the ecosystem. In the case of contemporary art institutions, user ✧ groups may include people interested in a specific type of contemporary art, cultural professionals, different types of investors (from tax-paying citizens to corporate sponsors and collectors), communities united by certain interests that are addressed by the organi-sation, workers inside the institution and, of course, artists.

2. *UX of art allows for cultural institutions to develop a deeper integration with artistic production processes*

An emphasis on producing and curating art experiences where the physical gallery is no longer 'the host' but is just one node or aspect of a larger, technologically integrated narrative requires reconsidering the possible functions of physical space in an entirely new light. It also calls shifting investment into other areas of infrastructural development that would allow for a deeper integration with artistic production processes.[33] This is not easy to process for bricks-and-mortar cultural institutions, not least because of the risks involved in any type of organisational reorientation that questions institutional identity. However, just as cultural institutions eventually had to face the reality of web 2.0, a similar predicament is going to arise as advanced virtual environments mature to a state of all-encompassing ubiquity. How optimal the response of cultural institutions can be depends on what operational realignments they are prepared to make now.

UX of Art

44
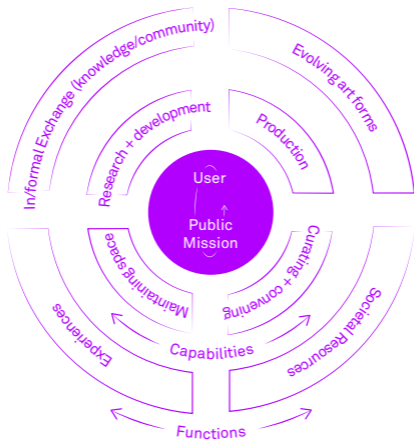
UXA encourages identification and investment in core capabilities and functions in order to deliver on the organisation's mission to its users.

P.46 top: For example, an organisation with a mission to support art experimentation would invest in R&D and production capabilities to foster evolving art forms.

P.46 bottom: By contrast, an organisation with a mission to facilitate cultural research and discourse would invest in R&D, curating and convening capabilities in order to foster knowledge exchange between the relevant fields and sectors.

Evolving art forms

Research + development

Production

User

Public Mission

Capabilities

Functions

In/formal Exchange (knowledge/community)

Research + development

User

Public Mission

Curating + convening

Capabilities

Functions

46
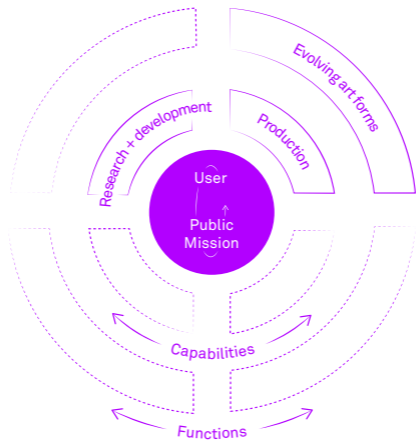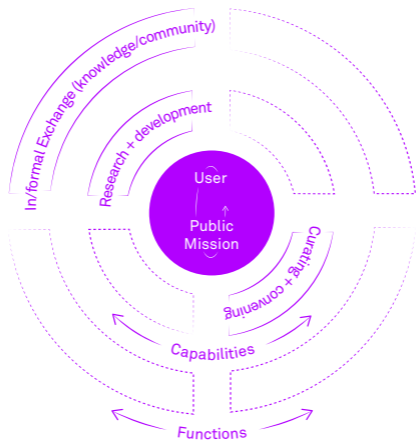
9.
p.29 Tony Bennett's *The Birth of the Museum: History, Theory, Politics* (London: Routledge, 1995) explores the wider political and social factors that influenced the formation of museums in defining public space in the late 19th and early 20th centuries.

10.
p.29 Brian O'Doherty's *Inside the White Cube: Ideology of the Gallery Space* (San Francisco, CA: The Lapis Press, 1986) identifies the 'white cube' as the ubiquitous successor to the display of art in the Beaux-Arts salon and foreshadows the importance of institutional identity and branding for cultural institutions in general. Similarly, Carol Duncan's *Civilizing Rituals: Inside Public Art Museums* (London: Routledge, 1995) examines the white cube among many other exhibition-based production models, contextualising the white cube as an explicit strategy within the history of art museums and exhibition practice internationally.

47

11. These ideas extend some of O'Doherty's
p.29 original arguments:

- 'The ideal gallery subtracts from the artwork all cues that interfere with the fact that it is art. The work is isolated from everything that would detract from its own evaluation of itself' (p.14).
- 'Who is this Spectator, also called the Viewer, sometimes called the Observer, occasionally the Perceiver? It has no face, is mostly a back. It stoops and peers, is slightly clumsy' (p. 39).
- 'A gallery is constructed along laws as rigorous as those for building a medieval church. The outside world must not come in, so windows are usually sealed off' (p.15).

12. To this extent, cultural institutions fulfil a critical
p.30 value-creating function in a rare objects economy.

Notes 9–33

48

13. Historically, there have been a number of attempts
to disrupt and reconfigure this model. Firstly, by taking the object outside the gallery walls, as epitomised by public art, site-specific art, and community art projects. Here, relevance and value have been more closely aligned with the interests and needs of specific places and communities. Secondly, by transforming the 'white cube' into a space for catalysing social interactions—an approach that, while having older precursors, last rose to mainstream prominence with the publication of Nicolas Bourriaud's *Relational Aesthetics* (Dijon: Les Presse Du Reel, 1998). Thirdly, by bestowing the general public with curatorial agency, effectively licensing a non-specialist group of individuals the right to determine what is put on view inside the white cube.

14. Instagram, Twitter and other paradigmatically web
2.0 technologies—'social media'—are not, according to this definition, advanced virtual environments. The former offer ways to view moving and still images that could be, for example, printed out or shown in a cinema. This is not the case with web 3.0 technologies that are premised on complex technological interactions.

15. Multi-user dungeons (MUDs) could be seen as early
precursors of today's MMOs. They were sophisticated text-based virtual environments that allowed users to code their own areas and interact, operating on local networks from the late 1970s.

16. *Fortnite, World of Warcraft and EVE Online* are some of the most popular MMO titles that also function as a social meeting ground.

17. 'Drop culture', popularised by brands like Supreme and powered by social media, is predominantly engaged with 'drops': when new or limited edition items are made available at a particular announced time and/or location. Drops have been highly successful at cultivating a dedicated following who, like gamers, share a collective set of interests and commitments. A 'raid' is a type of mission in a massively multiplayer online role-playing game (MMORPG) where players have to coordinate with each other in order to complete their task, whether that is defeating another group or obtaining something of value.

18. In its most sophisticated forms, this may overlap with the cultural institutional 'co-creation with communities' model where the process of co-creation or participation is durational rather than one-off, allows for formation of social bonds (in games, as guilds) and can become an integral part of one's general life experience.

19. In the UK, this expertise is available to the cultural sector via such organisations as The Association of UK Interactive Entertainment (UKIE).

20.
'Being framed' is a condition of the browser experience in general—being a tab within a world of tabs, or being communicated through the viewfinder of other people's social media accounts. Eventually, this condition could be extended to 360 degrees by fully digitised spaces.

21.
From 'The Adoption of Digital Technology in the Arts' by Digital Innovation Fund for the Arts in Wales (p.7). Link: https://bit.ly/3pSZWUf

22.
'Digital transformation' is a relatively vague term. Usually this is taken to be a move away from IT departments that procure, set up and maintain specialised equipment, on the one hand, and long, phased, stage-and-gate or 'waterfall' production processes, on the other, to lighter, faster and outsourced or cloud-based software (away from localised servers and databases) and agile, sprint-based production. The depth to which this change, which generally amounts to technological modernisation, is expected to take root varies by industry; given that the cultural sector is not involved in the industrial production of digital systems and products, digital transformation accordingly does not tend to be understood as something that profoundly shifts operations or organisational infrastructure.

23.
It is clear that digital technology does not straightforwardly 'widen access' but changes who is able to access what.

24. FAE1 describes how as a result of this complacency,
p.38 new actors have emerged to define this space.

25. Existing policy recommendations have shaped
p.38 consumer expectation that 'free' aligns with
accessible and that digital 'content' can be optimised
as a potential revenue stream for institutions.
Link: https://bit.ly/3gHDUj8

26. New media art institutions are somewhat of an
p.38 exception; the aim of new media art curators and
institutions has been to canonise the field of media
art and ensure its preservation and appreciation.
This is a different proposition to the role of the
digital curator addressing virtual spaces and digital
technologies as sites of cultural production.

27. See Andrew Dewdney's 'The Networked Image: The
p.39 Flight of Cultural Authority and the Multiple Times
and Spaces of the Art Museum' in *The Routledge
International Handbook of New Digital Practices
in Galleries, Libraries, Archives, Museums and
Heritage Sites*, edited by Hannah Lewi, Wally Smith,
Dirk vom Lehn and Steven Cooke (London: Routledge,
2019) for an assessment of issues that arise when
museums approach 'digital' as a set of tools rather
than a paradigmatic shift that requires a deeper
engagement with the underlying assumptions about
the role of cultural institutions in society.

28. *p.40* Arguably, the primary spur to cross-industry 'digital transformation' noted earlier is UX. The disparity between leading digital products (e.g. iOS, Google Search and Maps) and the internally-developed systems within many organisations is indexed in UX (in addition to maintenance costs, security, and other economies of scale). Most tech start-ups and scale-ups are now heavily driven by user experience, and are operationally structured as a set of teams that are defined more by their contribution to UX than to pre-internet departments; a simple example is the move from commercial organisations having large teams of people that sell, to small teams that design ways to assist customers to buy via site navigation, the check out process, and so on.

29. *p.41* Link: https://bit.ly/3h2yfVh

30. *p.41* See Gina Bloom's *Gaming the Stage* (Ann Arbor: The University of Michigan Press, 2018) for a historical view on the connections between video games and theatre.

31. *p.41* These have been utilised primarily in commercial settings.

32. *p.41* Virtual Factory was already in development when the pandemic hit, while SPUR was a direct response to the pandemic. Links: https://bit.ly/2RStNQg and https://bit.ly/3wmSOSv

33. *(p.44)* See 'The Distributed Museum' by Andrew Dewdney, David Dibosa and Victoria Walsh in *Post Critical Museology*, edited by Andrew Dewdney, David Dibosa and Victoria Walsh (London: Routledge, 2012).

Image credit: P.23-24 *Waterfall Mountain River* by Nikitos & 3130 on Sketchfab, Creative Commons Attribution 4.0 International https://skfb.ly/6AJ8t

Image credit: P.25-26 *River's Drainage* Basin by Constantin Os on TurboSquid, Standard 3D Model License. Link: https://bit.ly/2TKYcAH; *Striking Mountains* created by aqsa_g on Sketchfab, Creative Commons Attribution 4.0 International.
Link: https://skfb.ly/onrBO

*There's been a massive explosion of people
realising that gaming is an incredible
space and that the technology behind
it is driving new kinds of creativity.*
Werkflow

2

Art Adjacency

Game Technologies

Today, 'game feel'—that is, the presence of general attributes of game systems, mechanics and aesthetics in non-game or 'real-life' situations—is all-pervasive.[34] The wide adoption of video game technologies to produce advanced virtual environments is playing a critical role in this. Real-time ✳ 3D ✛ game engines, such as Unity and Unreal Engine, are development environments that offer an array of functionalities through their unique capability to connect to ancillary technologies, plug-ins and tools in order to build an infinite variety of advanced virtual experiences.[35]

59

The game engine can be understood as a modular hub that integrates real-time ✳ rendering of visuals, spatial ✛ audio, multiple forms of artificial intelligence, user interface design ✛, physics simulations, animation and data management with real-time ✳ user interaction ✛.[36] It is precisely this utility

as a key tool of 'virtual production' that has driven the use of game engines beyond the games industry in the last decade, propelled by flexible and broadly accessible licence arrangements.[37]

Once the software layer of game engine environments is connected to the hardware of augmented and virtual reality (i.e. immersive technologies—the devices that bridge our connection to a multi-sensory and material world)—as well as cloud computing and 5G (which provide the necessary computational and networking power), what emerges is the possibility of planetary-scale simulations that layer assets, systems and behaviours in real time.[38] [39] Therefore, the game engine is not only the interface to a fully developed ecosystem for building advanced virtual environments, but likely an emerging interface layer of the metaverse stack.[40]

While the metaverse has numerous competing visions, there are certain qualities by which it is often defined:

7

1

6

User

2

5

3

4
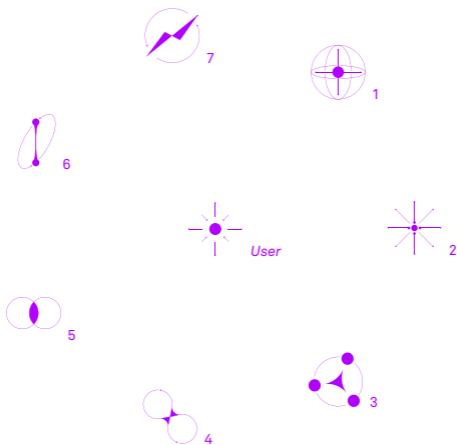
1   Spatial and 3D
2   Real-time
3   Shared with multiple concurrent users
4   Persistent: it continues to exist and evolve
     even when users aren't interacting with it
5   Hybrid: layered and integrated between virtual
     and physical but perceived as a single reality
6   Interoperable: it is possible to exchange assets,
     carry over avatars and value, and move
     seamlessly between worlds
7   Generates functioning economies that merge
     with and influence the global economy

The term 'metaverse' will stick until we develop more precise language. We're seeing more and more technologies leading towards similar horizons. So whether it's web 3.0, video games, or the arts sector, plus the increasing cultural significance of team-based inter-netting, 'metaverse' provides one of the few reference points that can play across them all.
Kei Kreutler

Artistic Experimentation in Art-Adjacent Fields

Since the development of early computer graphics, animation and the web in the 1980s, artists have been critical contributors to the evolution of virtual environments.[41] Although opportunities were limited, artists who gained access to the research labs that were building these novel tools were able to experiment with and influence technologies at an early stage of development. By the 1990s, with the increasing availability of consumer technologies such as PCs and wider access to the web, artists became more embedded in various experimental online scenes that were probing the potential of these spaces.[42]

Today, a different set of conditions for artistic experimentation is arising from the combination of flexible licensing for various software including game engines, dropping pricing points for hardware (e.g. motion capture, VR devices and GPUs) and free self-education tools such as online tutorials. Lowering barriers of access to these technologies means

that there is increasing literacy around their use and less dependence on institutions, whether research labs or other types of organisations including cultural institutions, for the development of artistic work in or with advanced virtual environments. Yet, artists interested in working with these technologies in a sustained and scalable way are best served by those *art-adjacent fields* that have a concrete stake in embedding and developing technologies with the operational pathways for making that work happen.

Gaming is a field in which it is clear that the technology is endogenous to the industry's development. Currently, gaming has highly cohesive support mechanisms for artistic experimentation with metaverse technologies. The intersection of *gaming* and *blockchain* is also creating new organisational models and markets for artists working in this space. There are also more traditional industries that offer R&D space and production pipelines to artists, namely *film* and *architecture*.

65

Indie is the engine of creativity in games
because people are taking risks and that
feeds into the wider industry.
Chella Ramanan

The indie games ecosystem is where artistic vision is supported and scaled by business models, engagement mechanisms and distribution platforms

Video games are not only a highly evolved artform on their own terms, but a sophisti-cated, large-scale industry, with diverse and highly functional production, dissemination, engagement and business models, and extant and implied political and ethical problems and potentials.[43] The games industry is typically segmented into 'indie' and 'AAA'. In the latter, publishing companies such as Electronic Arts, Ubisoft, Rockstar and Activision represent the top tier of the industry, releasing blockbusters such as *Call of Duty*, *Animal Crossing*, *Red Dead Redemption 2* and *DeathStranding*. With large production and marketing budgets, these releases are more akin to film produc-tions than classic video games.[44] By contrast, the 'indie' scene is generally seen to be driven by artistic vision, risk-taking and experimen-tation.[45] Both are underpinned by various infrastructures geared towards large-scale user engagement and sustainable business models.

Art Adjacency

66

For example, the ability to port games to a number of different consoles and platforms such as Steam, Epic Games Store, Google Play, Apple's App Store and itch.io have been important touch points in the growth of indie games. As a result, the distinction between AAA and indie is not always clear-cut. Many indie studios have quickly matured into sophisticated business operations, enabling small teams to release what become block-buster titles, examples of which include the recent success of *Hades*, published by Supergiant Games, and the wildly popular farming role-playing game *Stardew Valley*.[46][47]

(p.81)
(p.82)

Indie producers utilise a plurality of business models, ranging from raising money on Kickstarter and providing early access, to using Patreon or Ko-fi for ongoing support and building social and economic relationships with their communities.

Use of gaming technologies
(engines/hardware)
in various fields

Blockchain

Games

Film

Architecture

Art

Art Adjacency

Art adjacency

68
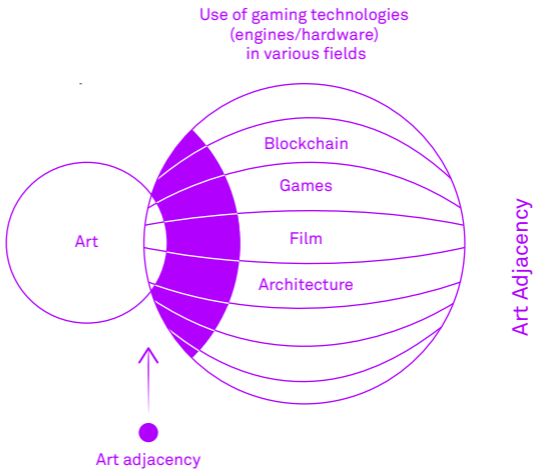
*Art-adjacent fields are increasingly becoming sites
for 'metaverse-native' art through supportive infrastructure
and greater integration with game technologies.*

In the UK, indie studios and partnerships are incentivised to set up special-purpose vehicles (SPVs) to develop operational models that are further supported by Video Games Tax Relief, in-game transactions and increasingly complex in-game economies such as those that exist in MMO games, and which serve as spaces for prototyping new financial models and forms of value exchange.[48]

Video game technologies and blockchain are creating new market mechanisms for artists working in the metaverse

An increasing number of technology actors at the intersection of video games and blockchain technologies are driving a decentralised vision of the metaverse through the development and prototyping of new softwares, platforms and protocols that can support alternative economic and governance models.

This is evident in the movement of Decentralised Autonomous Organisations (DAOs) into virtual worlds. A DAO is a user-governed collective organisation with

transparent rules and mechanisms underwritten by distributed ledger technologies. Compared to traditional hierarchical organisations, DAOs enable rapid scaling of user ☩ participation and agency in making decisions, leading to their operationalisation in a number of advanced virtual environments such as Decentraland.[49]

The first fully decentralised virtual world, Decentraland allows players to explore the environment as a typical game space, but its virtual land is tied to and transferable through the Ethereum blockchain. Players can purchase Decentraland's MANA, an ERC-20 token, through the use of cryptocurrency exchanges and store these tokens and relevant Decentraland assets in general purpose digital wallets such as Metamask. The trade and exchange of these assets exposes the value of in-world land and property to cryptocurrency markets.

At the same time, the explosion of non-fungible tokens (NFTs) during the first quarter

of 2021 demonstrated the latent potential of blockchain technologies as a vehicle for expanding available market mechanisms and display arenas both for existing art industry actors and new ones.[50]

p.83

Art Adjacency

71

If the metaverse is built upon openness and wanting to bring down technological, economic and creative barriers, the digital assets and experiences that creators build could be transported pretty much anywhere.
Liam Hamill

The film festival circuit and its supporting structures are paving the way for the creation of 'immersive storytelling' as a new metaverse genre

In 2007, the launch of the New Frontier programme at Sundance Film Festival created a space for practitioners to develop, show and pitch works bringing the fields of technology, film, gaming and storytelling closer together.[51] Described as 'the first conjunction of art and games', this new strand was built on top of an existing and well-developed infrastructure of development, production, distribution and established frameworks of remuneration for the many specialist roles in the film industry.[52] The expansion of this approach into other film festivals across the world, including Sheffield DocFest, CPH:Dox and the BFI London Film Festival, has created a decentralised support network for experimentation in the field, access to networks and knowledge, and sources of funding and distribution for artists and creative producers.

Furthermore, the proliferation of virtual production tools in film and television has

72

p.83

p.83

created a supportive ecosystem for artists and producers working with game and related immersive technologies for many years.

This has paved the way for the genre commonly known as 'immersive storytelling'. The combination of narrative development with the use of swiftly maturing AR/VR technologies, and powered by game engines, has expanded beyond the film festival circuit to become a nascent market of its own.[53] The immersive economy ⌖ in the UK has seen particular growth in the last five years, bolstered by government-sponsored industrial strategy R&D funds distributed by the UK Research and Innovation Network of research councils, plus other forms of research and innovation funding, such as Innovate UK development funding for immersive storytelling studios and other small and medium-sized enterprises (SMEs).[54]

Immersive storytelling could provide a deeply emotional experience. That's why it's spread like crazy and why now you don't see a film festival that doesn't have a sidebar of VR work.
Mark Atkin

Architecture is an entry point into the construction of virtual civic spaces

Game technologies are generating new design frameworks within large international architectural practices, smaller experimental studios and architecture education. Most architectural information is now created and exchanged using software that is interoperable with game environments.[55] This has bolstered a basic literacy in metaverse technologies across the field.[56] As a result, many new roles have emerged within architecture, including dedicated teams of architects using game engines for both visualisation and simulation purposes.[57]

There is a new generation of experimental architects working with game technologies to explore advanced virtual environments through augmented reality construction systems and generative design.[58] New models of spatial ⊕ design include Block by Block, a partnership between *Minecraft* developer Mojang, Microsoft and UN Habitat, where the game is applied as a community design tool, allowing for public participation in

regeneration projects. Game engines have also allowed Forensic Architecture to build detailed simulated reconstructions as part of their human rights work.[59] As a field, architecture provides a framework for experimenting with metaverse technologies for civic and political purposes.

76

How are we going to deal with advanced virtual environments if we understand them as public spaces? And therefore, what is the role of architects vis-a-vis the virtual if we compare it to the role of architects in the physical realm, where architects have historically been very much involved in shaping public space not only formally but through legal means as well.
Space Popular

The art-adjacent industries of gaming, blockchain, film and architecture offer significant commercial, developmental and civic-engagement opportunities for artists experimenting with advanced virtual environments. However, this fragmentation between the interests of different industries risks narrowing the ways in which artistic vision could benefit the evolution of the metaverse and how accountability to users ⊹ is defined.

Who is the metaverse for? Who gets to be a part of that metaverse? And who gets to decide? Who gets to build the tech-nology, and who gets to deliver on those digital pieces of land? We need policy. We need interdisciplinary approaches to how we build a safer internet.
Immersive Kind

Notes 34-59

34. *‘Game feel’ is proposed by Steve Swink in *Game Feel: A Game Designer’s Guide to Virtual Sensation* (London: Routledge, 2008) and can be read as an expansion of the notion of gamification. In a contemporary context, gamification is attached to both marketing practices and mobile apps, such as Uber, Twitter or Foursquare.

35. As Ian Bogost argues in *Unit Operations: An Approach to Videogame Criticism* (Cambridge, MA: MIT Press, 2006), ‘game engines move far beyond literary devices and genres. Unlike cultural categories like the modern novel or film noir, game engines regulate individual videogames’ artistic, cultural, and narrative expression’ (p.56).

36. A game engine may tie multiple, heterogeneous games together through a shared system for rendering objects or regulating physics. Even a highly bespoke engine such as Konami’s Fox Engine, originally built by Hideo Kojima’s Kojima Productions for the *Metal Gear Solid* series of games, was also used to power the *Pro Evolution Soccer* games for many years.

37.
p.60

For example, the Unreal ecosystem is built on Epic Games' Unreal Engine, and is used to develop games produced by Epic and other game studios but also advanced virtual experiences more generally such as in music video production. Royalties for the use of the engine are only paid above a certain financial threshold, so in many cases it can be used for free. Developers typically extend and customise the engine to their needs. There are also a series of software products built using the Unreal Engine but intended for other industries, for example Twinmotion, an architectural visualisation rendering software purchased by Epic in 2019, developed specifically for the architecture and construction sector.

38.
p.60

Graphics processing unit (GPU) computation, performed using graphics cards, has long underpinned gaming. In the 1990s a new generation of gaming GPUs emerged from companies such as 3dfx Interactive, applying stripped-down technology from rendering units used in the film industry and allowing the gaming industry to move into rich, real-time 3D environments. Today, GPU computation is also applied in fields such as deep learning and cryptocurrency mining.

39.
p.60

Pokémon Go, the AR game developed by Niantic, and built on the Niantic Real World platform, is still the most successful example of a scaled real-time virtual experience.

40. In Benjamin Bratton's model of The Stack, the Interfaces rely on many conventions and these are not restricted to the visual layer but extend to various assumptions about cause and effect. See Benjamin Bratton's *The Stack: On Software and Sovereignty* (Cambridge, MA: MIT Press, 2015).

41. There is a rich history of this practice—for example, in the 1980s, Rebecca Allen situated herself in research environments such as the New York Institute of Technology, MIT and Nokia in order to access the equipment and software to make art. At the same time, she was responsible for conceiving of and building the required tools and interfaces, making an important contribution to the development of 3D graphics, animation and motion capture.

42. Furtherfield has been a key initiator and supporter of these experimental practices since 1996.

43. Comprising 2.6 billion users—a billion more than five years ago—the video games industry has long been one of the largest and fastest growing industries relating to culture and entertainment. According to UKIE, in the UK alone, the games industry reached a valuation of £7 billion with a 29.9% increase in annual sales from 2019 to 2020. Link: https://bit.ly/2Trzfdc

44.
p.66

One of the first AAA games was Square Enix's *Final Fantasy VII* (1997), which had a production budget in the tens of millions of dollars. The game was notable for its worldbuilding, using the deep integration of animated cutscenes and advanced 3D graphics. The *Final Fantasy* series has continued to push highly detailed game worlds and cinematic storytelling, including feature-length animations based on the universe.

45.
p.66

Indie games have driven the games industry as we recognise it today. *Minecraft*, having started as an indie game, is now arguably the largest AAA game ecosystem. Many tropes of AAA gaming developed from the risk-taking and experimentation of indie games. For example, roguelike games, where death causes the game to restart from scratch with a new spatial layout, enemies and items, is a genre that gained popularity through indie titles such as *Spelunky* and *The Binding of Isaac*. The recent game *Returnal* leverages these mechanics into a AAA experience framed as one of Sony's launch titles for the Playstation 5.

46.
p.67

See Mike Diver's *Indie Games: The Complete Introduction to Indie Gaming* (London: LOM Art, 2016).

47.

These platforms provide different models for developers to engage with consumers. Steam's Early Access programme allows players to purchase and play games that are still in development, meaning that developers can refine their games in advance of a final commercial release. itch.io is a platform that is more focused on indie and experimental games, allowing developers to create their own storefronts and operate a 'pay what you can' model for their game titles. Apple's App Store may be considered the most closed and proprietary of these platforms, although curated selections such as 'Game of the Day' can drive significant traffic to smaller releases. The App Store's limitations on 'family friendly' content, in-app purchases and a 30% revenue cut for Apple have led to Epic filing an antitrust lawsuit against Apple citing anti-competitive behaviour. Epic's own Games Store is more similar to Steam, but with the addition of 'exclusive' titles, games that have either permanent or time-limited releases solely on Epic. Subscription models such as Apple Arcade and Microsoft's Xbox Game Pass have gained traction as Netflix-style game delivery services, offering both AAA and indie games as part of a regularly updated package of titles.

48.

For example, see the work of former Greek finance minister Yanis Varoufakis on in-game economics as a prototype for fiat fiscal policy during his tenure. Link: https://bit.ly/35hQnF2

49.

Other examples of emerging art DAOs include Flamingo DAO, CabinDAO, $WHALE Community and $FWB.

50. NFTs can be seen as the first major but still very
p.71 nascent wave of this cultural shift in the art world.
While the stratospherically high NFT prices at
major auction houses in the early months of 2021
distracted from a situation in which the vast majority
of art NFTs were loss-making, the mid-term story
is the incorporation of NFT logics and technologies
across the art world in an incredibly rapid process of
diffusion; as of summer 2021, a large proportion of
major cultural institutions has been in the process
of developing NFT capabilities. The long-term, global-
scale impact of this on the art industry could be
substantial if NFTs unlock a new paradigm for the
circulation of creative works, therefore introducing
new audiences and economic actors to the
conventional art industry.

51. In the first year, Lynn Hershman Leeson presented
p.72 a work in Second Life that included a Q&A with
audiences across the physical gallery and virtual
locations. Link: https://bit.ly/3vfTAiN

52. The turn of phrase is owed to Mark Atkin of XO Labs.
p.72

53. When the VR filmmaker and immersive journalist
p.73 Nonny de La Peña's *Hunger in LA* was accepted
for Sundance in 2012, her intern, Palmer Luckey,
developed the first Oculus prototype for the film to
be experienced in VR by the public, spurring a new
wave of VR/AR software and hardware development.

54. *The Immersive Economy in the UK Report 2019* published by Digital Catapult, Immerse UK and PwC, 'the UK is currently Europe's largest market for VR and AR, tapping into what is predicted to become a $160 billion immersive technologies market'. This may have been strengthened by dedicated Audiences of the Future Challenge funding in which £39.3 million was invested in the development of new immersive technologies for the cultural sector as part of the government's Industrial Strategy.
Link: https://bit.ly/35eA0cr

p.73

55. Architectural information is typically exchanged between software using file protocols such as DWG (an open format by Autodesk), OBJ (a 3D model format by Wavefront) or FBX (3D model format also owned by Autodesk). These file formats are also commonly used in the games industry for environmental design.

p.75

56. This adoption is the product of a close relationship between architects and software companies established with the 'digital turn' of the 1990s. At that time, computer-aided design (CAD) software and modelling tools from the animation industry were adopted not only for commercial utility, but as part of a growing discourse in architecture. Today, the studios of architects such as Frank Gehry develop custom software tools through offshoot companies (Gehry Technologies) while conferences such as ACADIA and the Media Architecture Biennale provide support and research platforms for architects working with computational technologies. This engagement with software both commercially and through discourse means many young architects and educators are typically fluent in both 3D design tools and some form of programming language.

57. These include designing spaces for virtual environments (such as online conferences); working as analysts refining buildings and spaces through game-based simulations; working as consultants building participatory design environments, and roles producing real-time visualisations of architectural projects.

58. Emerging architecture studios and designers working on such projects include Space Popular, You+Pea, iheartblob, Soomeen Hahm and Damjan Jovanovic. Jose Sanchez (Plethora Project) is an example of an architect who has moved into commercial video games (*Block'hood*, 2017).

Notes 34–59

85

59. Forensic Architecture used digital imagery created in
Unreal to train an AI to recognise tear gas canisters
for the purposes of analysing real-world imagery.
Link: https://bit.ly/3vkDvZe

p.76

Image credit: P.55-56 Image assets created
by Zion König
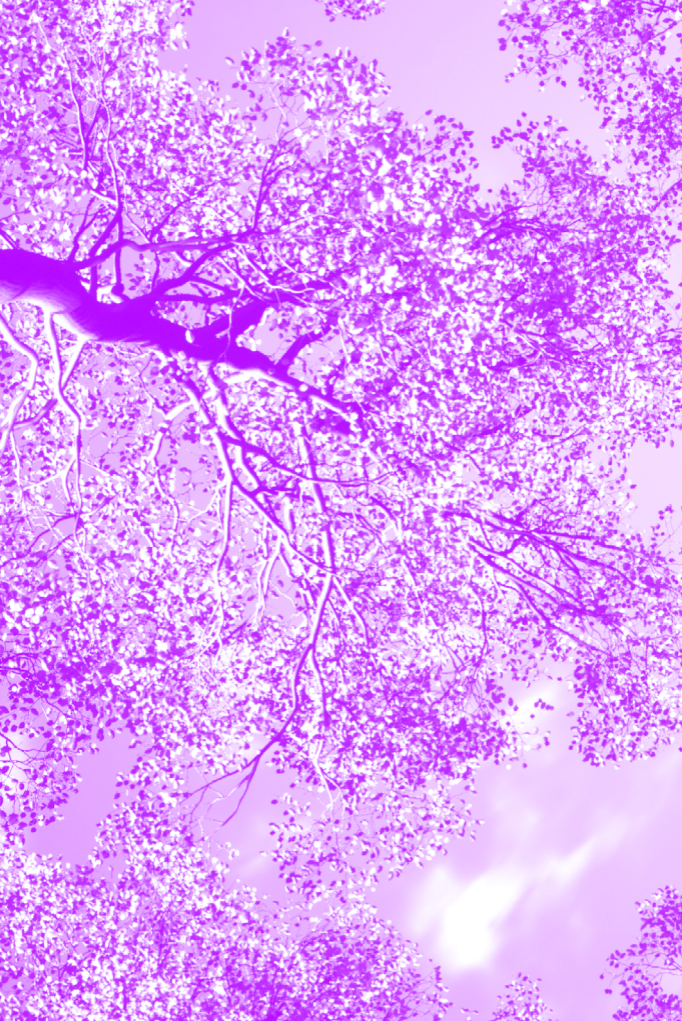
3

Vectors for 21st-Century Cultural Infrastructure

The first volume of Future Art Ecosystems identified three strategies that are shaping art's infrastructural future: the tech industry as art patron, the art stack and 21st-century cultural infrastructure. The first two shift the custodianship of the production and dissemination of art that engages with advanced technologies to other sectors and adjacent fields. The third strives to construct *a space that fulfils the public mission of cultural institutions by reorganising the operational logics and investment priorities of the cultural sector*.

Art stacks and the tech industry have been making significant strides in defining the trajectories of future art ecosystems by developing the various infrastructural plays relating to space and time, skills and equipment, and products and services, as identified by FAE1.[60] *Such infrastructural prototyping is currently missing from the larger public cultural institutional landscape*. In isolation, individual cultural organisations lack the leverage to establish their own technical, financial and distribution infrastructures, or to influence the development

of platforms and emerging technologies, such as those that are shaping the metaverse. This leads to a persistent ⚬ loss of developmental opportunities and unaccounted transfers of value, which further undermines the potential of cultural institutions represent public interest around questions of governance, ownership, accountability and ethics.[61]
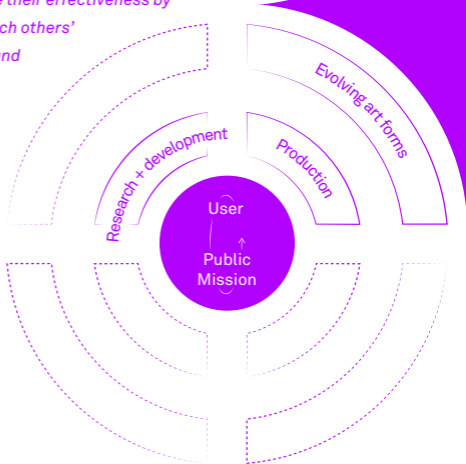
Embedding UX of art as a means to operationalise cultural institutional missions at the scale of individual organisations, then, must also be accompanied by a vision of 21st-century cultural infrastructure at the scale of the cultural sector as a symbiotic ecosystem, rather than as a patchwork of individual organisations competing with each other for engagement, funds and relevance. This requires a profound reconfiguration not just of how individual organisations articulate their presence and value within a wider metaverse landscape (as discussed in Chapter 1), but of the objectives shaping the construction of 21st-century cultural infrastructure. Building for *interoperability*; ⚬ investing in

Curating + convening

User

Public
Mission

Research + development

Informal Exchange
(knowledge/community)
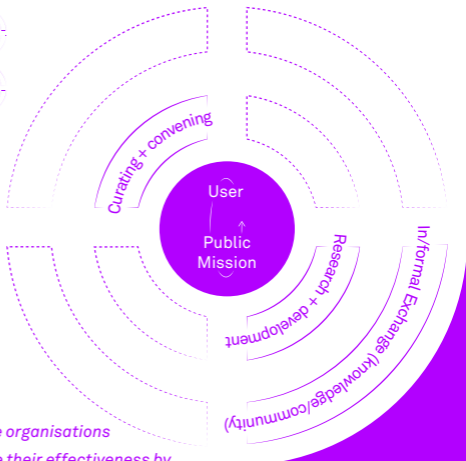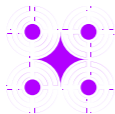
*Interoperable organisations
can maximise their effectiveness by
leveraging each others'
capabilities and
resources.*

Evolving art forms

Research + development

Production

User

Public
Mission

User

Public
Mission

Maintaining space

Experiences

Societal Resources

Research + development

Experiences

User

Public
Mission

Vectors

94
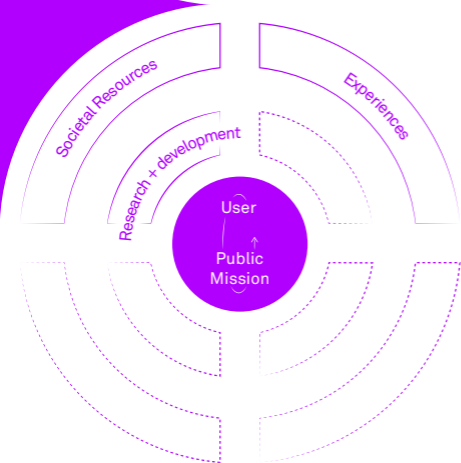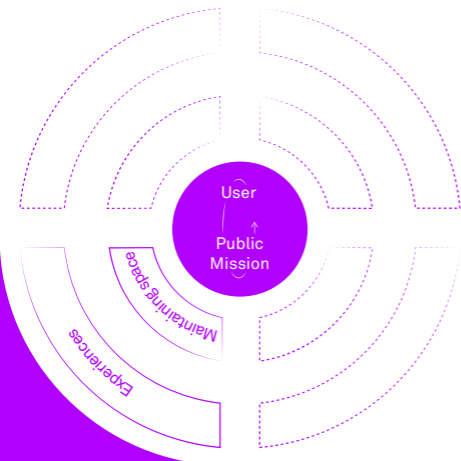
advanced production capabilities; recognising and supporting *expanded economic and distribution rationales*; harnessing new proficiencies for deeper engagement with *users-as-stakeholders*; and devising *new systems of measurement* are the vectors for shaping infrastructural plays that individual cultural institutions can adopt in order to play their part in the construction of 21st-century cultural infrastructure.

Building for Interoperability

*Cultural organisations need to
share infrastructure if this is a space
we're all interested in.*
Gabrielle Jenks

'Interoperability' ⟁ is a term originating in
information technology that refers to the
ability of different systems to share and
make use of data and resources reciprocally.
From a user ✦ perspective, interoperability ⟁
allows an individual to traverse different
contexts and worlds in a way that optimises

user ✛ agency and expands economic ↗ and social opportunities. From an organisational perspective, interoperability ⬰ makes it possible to leverage external resources at the cost of seeking comparative advantage. From an ecosystemic perspective, interoperability ⬰ is one of the ways to prevent the emergence of monopolies.

Interoperability ⬰ is equally critical for the metaverse as it is for a robust and agile future art ecosystem. The latter calls for investing in capabilities-led cultural institutions, both old and new, and building operational bridges between organisations within the cultural sector as well as with art-adjacent fields. While this may be a long-term goal, there are a number of areas that can be developed in the short to mid term. They include, but are not limited to:

- Broader policy alignment around public-private partnerships relating to technologies that fulfil key infrastructural functions;

- New roles and processes inside organisations to promote a focus on institutional interoperability ∮;
- Legal partnership frameworks and contracting arrangements that need to be standardised and open sourced within the sector to enable efficient interoperability ∮;
- In the UK, expanded deployment of the independent research organisation (IRO) status to ensure distribution of value across all niches of the art ecosystem;
- Interoperability ∮ as a function that expands beyond national policies.

Investing in Advanced Production Capabilities

I've never heard of an art gallery building a game engine.
Danielle Brathwaite-Shirley

Insofar as institutional programmes are predicated on continuously presenting new on-site projects, production is ad hoc. Most cultural institutions are likely to outsource major aspects of production and organise briefs around the needs of specific projects rather than retain-able knowledge and infrastructure.[62]

In contrast, 21st-century cultural infrastructure requires longer-term thinking and strategy in order to advance production capabilities. [63] Interoperability between cultural institutions at the level of advanced production would increase knowledge exchange between organisations, raising the profile of work that can be achieved by developing joint R&D and production pipelines. This collective infrastructure would deliver a valuable proposition to metaverse-proficient artists who could benefit from progressing or scaling their work.

Similarly, in the longer term, 'in-sector' (as opposed to outsourced) specialist skills are of critical importance for cultural institutions to support art-led technological innovation. They would provide a path to developing unique expertise that could eventually transition institutions from generalist cultural commentary on a wide array of (technology-related) phenomena to deploying specialist knowledge to represent public interest in larger societal processes. [64]

The areas to address include those that concern interoperability, 𝒮 but also extend to:

- Policies for government investment into sector-wide infrastructure, and the need to focus on cumulative development of shared ✸ infrastructure;
- Policies and conditions for direct capital investment into public infrastructure;
- Protocols around open source development.

Recognising and Supporting Expanded Economic and Distribution Rationales

Any arts entities that work seriously with technology very quickly see that it's an expensive game and that it can exhaust cultural funding. Understandably, within the current framework, the funding just doesn't allow for forays into the more tech-heavy side of the arts.
Robin McNicholas

Underinvestment in production capabilities and infrastructure is closely tied to current funding and business models, which are generally geared towards supporting discrete artist or exhibition outputs at individual institutions.[65]

p.114

The current economic ✐ set-up places great constraints not just on the development of advanced production capabilities but also on providing a more diverse set of economic ✐ opportunities for artists who require significant investment to develop their practices in an emerging technological space. [66]

The traditional art industry is optimised for the acceleration of asset portfolios comprising the works of artists who have long been established as of art-historical importance. However, as discussed in FAE1, its mechanisms are largely inadequate for supporting the development of contemporary artists working with advanced technologies, as well as emergent models for coordination and organisation. Redistributing the risks of investing in artistic experimentation in the metaverse would be best achieved as an inter-institutional KPI.[67] Again, it is interoperability ∅ between organisations that promises greater diversity of economic ✐ models and the necessary scale of distribution to make these models realisable.

Considerations around distribution platforms and infrastructure largely mirror those of advanced production. Fragmented virtual worlds (or 'gated gardens', if they follow the paid subscription model) of competing cultural institutions are unlikely to have sufficient visibility in the plethora of advanced virtual experiences delivered via commercial platforms that serve as the entry point into any user's ✧ collection of virtual worlds.

Therefore, some form of collectivisation between present-day cultural organisations —either at the level of interoperable virtual experiences or at the level of a unitary platform—seems inevitable if 21st-century cultural infrastructure is to exist and for cultural organisations to retain low or no access charges as part of their public mandate.[68] Some questions to consider are:

- What are the policies and capabilities that traditional institutions and stakeholders should develop in order to support new and emerging talent?

- Can the interplay of economics ✎ between 'real' and virtual worlds lead to a means of creating greater engagement with and value in institutionally-driven production?
- In the UK, would a 'BBC of the metaverse' offer a possible model for understanding the role of the public sector in this space?

Vectors

Harnessing New Proficiencies that Propel Deeper Engagement with Users-as-Stakeholders

UX of art proposes a view on how cultural institutions serve different user ✢ communities from the perspective of individual organisations, policy and funders. UXA both includes *everyone* with whom any given organisation interacts and also seeks greater precision in understanding who these user ✢ communities are.[69] Within this large and ever-changing group of users ✢, any given cultural institution will have a few *stakeholder groups* who have a vested interest in the processes, outputs and impacts delivered by the organisation, and contribute to its raison-d'être. Thus, more engaged and lasting relationships with key stakeholder communities would also lead to the greater organisational focus— on specific capabilities, activities and modes of engagement—that is crucial to 21st-century cultural infrastructure.[70]

In some ways, new cultural organisations are well placed to integrate the concept of

p.115

p.116

users-as-stakeholders ✛ into the design of their organisation and its processes, such as the creation of DAOs and collaborative interactive production models made possible by platforms like Twitch. Although these are still emerging parts of the future art ecosystem, they offer forms of agency to artists and those interested in art that traditional cultural institutions cannot.

— ✦ —

There are other routes to formulating engagement with users-as-stakeholders ✛ beyond organisational or project-specific co-creation and co-involvement—for example, developing new service models for specific stakeholder communities with vested interests in the institution's capabilities. This would necessitate a clearer definition of what constitutes public service provision and commercial offer, and what operational and financial configurations are triggered by each.

107

— ✦ —

Virtual spatial

e.g. game engines,
apps, virtual assets,
community hubs

Virtual operational

e.g. data, internet
of things (IOT),
real-time
platforms, 5G

Physical spatial

e.g. urban
environments,
museums, shops,
parks, homes

Physical operational

e.g. electrical grid,
data storage
facilities, waste
management

Vectors

108
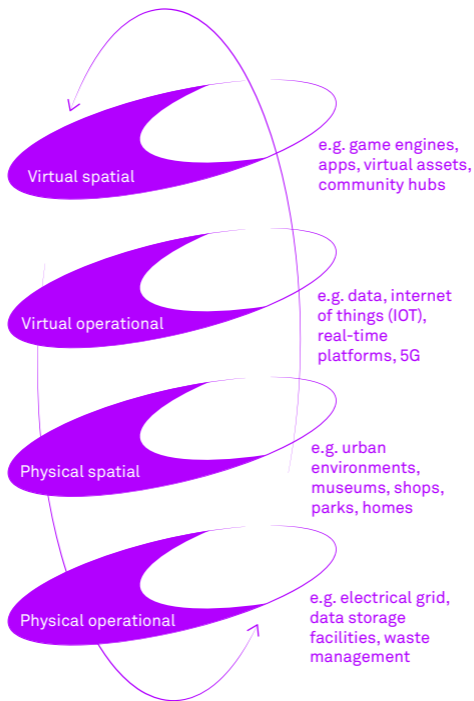
*A model for 21st-century cultural infrastructure from
the perspective of metaverse involvement that shows
the need to strategise intervention across all layers.*

To this extent, proficiencies around governance, legal arrangements and new IP models will need to become more of a core specialism of 21st-century cultural infrastructure to navigate the increasingly complex issues pertaining to rights, data and ownership that the metaverse will inevitably pose.[71][72]

Some of the areas that would require further enquiry include:

- Devising accountable processes around prioritising stakeholder groups;
- The reconstitution of organisational legal structures to enable participative governance;
- Amendments to legal structures in order to enable different governance modalities;
- Policies that recognise the need to strike a good balance between data-driven approaches to making decisions and organisational risk-taking required for innovation;
- Protocols for selecting appropriate technologies for organisational design and governance.

Devising New Systems
of Measurement

*Curation is probably a component that holds
some power in this ecosystem, in the sense
of having unique abilities to create temporal
moments that are hard to achieve
for other types of actors.*
Andie Nordgren

An engagement with the metaverse presents
an opportunity to revisit some of the wider
historical core functions of cultural institutions,
such as *display*, *financialisation*, *preservation*,
archiving and *curation*. Instead of serving
as backdrop conditions for the overarching
imperative of driving footfall to physical
spaces, these functions may start to resemble
distinct modes of value exchange as part of
21st-century cultural infrastructure. There
are a number of issues that would need to be
addressed in order to move in that direction.

Firstly, systems of measurement can and should be engaged positively and actively as productive organisational tools. The cultural sector's usual approach to metrics has tended to be limited by a lack of capacity for, or understanding of, certain methodologies, as well as a received notion that arts and culture are primarily qualitative modalities, which to some degree are inherently immeasurable. But, updating this kind of approach does not entail a technocratic turn—decentralised practices may, in part, be the most productive and apposite for developing new cultural metrics for the 21st century.

At the same time, in the context of the metaverse and its complexification of the structures of cultural experience, systems of measurement cannot be limited to evaluating how institutions perform in delivering certain services and experiences to their users ✥. A new metrics must also take into account how public cultural institutions can produce new ethical models and social contracts with their users ✥, and the various ways in which their use of the vast amount of data produced is a question of wider political, economic ✍ and cultural significance.

From this point of view, the task of 21st-century cultural infrastructure is not to continue the paradigmatic operational logic of culture seen predominantly as an *industrial sector*, but rather, to intervene and to synthesise at the intersection of 'culture' in the broad sociological sense, and technological and economic ✐ development. Within this expanded context of cultural-institutional operation, exploring new cultural metrics comes with an imperative to wield its indicators as tools to generate new organisational initiatives instead of reasserting the status quo.

Maybe there should be someone telling us to eat our vegetables, because otherwise we're just going to eat candy all day long.
Trevor McFedries

60. *p.91* 'In sports, especially in the US, the term *play* describes a coordinated set of moves by members of a team. Typically, a portfolio of plays will be designed and rehearsed in advance and then deployed opportunistically, where and when circumstances are favourable to it. The play is therefore both more than a purely tactical improvisation, yet less than a full-fledged strategy intended to *win the game*.' F AE1, p. 76

61. *p.92* When it comes to the relationship between public cultural institutions and private technological providers, the concerns raised are somewhat distinct from those that are typically raised in relation to the private funding of public institutions. Here the issue is not so much about 'art washing' reputational capital and lobbying of private agendas as it is about making cultural institutions progressively more redundant when cultural experiences are delivered on private platforms that drive value almost exclusively to the platform itself.

62. *p.99* See Mariana Mazzucato's *Mission Economy: A Moonshot Guide to Changing Capitalism* (London: Allen Lane, 2021) which analyses this phenomenon as a part of a wider discussion around public policies and economics.

63. Cultural institutions may have great proficiency in social media, CMS, finance softwares and other general organisational systems, but this expertise is geared towards administration of projects rather than towards creative production per se.

64. The success of human rights NGOs to carve out a significant power base within civil society and mainstream politics over the course of the last 70 years is to a large extent a product of organisations developing expertise on narrow (but critical) public interest issues, such as the death penalty (e.g. Innocence Project), secret prisons (e.g. Reprieve), children's rights (e.g. Save the Children) and human rights violations related to exploitation of natural resources (e.g. Global Witness). Meanwhile, there are only a handful of 'generalist' human rights organisations such as Amnesty International and Human Rights Watch that will undertake advocacy and campaigns on what they determine to be the most urgent human rights issues to address at a particular point, and which will shift with time. The 'source' of their organisational interoperability is international human rights law.

65. For cultural institutions, infrastructural investment is most commonly associated with investing in real estate as is evident from the relocations and building extensions of various major institutions. In general, cultural institutions are currently limited to three modes of direct economic activity: fundraising for specific outputs such as exhibitions or commissioned artworks; charging visitors either directly or via membership schemes (although not all do that); and

114

commercialising use of their real estate and assets (e.g. sub-rents, events, merchandise).

66. Setting up studios as LLPs, or an equivalent, that deliver both artistic and commercial work has been an important way for practitioners to secure necessary investment and develop their practices.

p.103

67. A proposal for shared institutional KPIs has been raised by Clare Reddington, CEO of Watershed, as part of the Creative R&D Working Group initiated and convened by Serpentine R&D Platform and National Gallery X. A report commissioned by Arts Council England and produced by the Working Group on the future of creative R&D in the arts sector will be published in Summer 2021.

p.103

68. Free or low-cost access might become a unique and critical feature of the 21st-century cultural infrastructural offer, given the tendency for virtual experiences (whether AAA game titles, freemium games with in-game purchases to unlock features, or ticketed immersive installations by art stacks such as Van Gogh and teamLab) to be fairly costly.

p.104

69. While this view is included here from the perspective of digital strategy, there are other models for how cultural institutions can serve different user communities. For example, the Centre for Possible Studies, and subsequent methodology developed by Serpentine's Civic and Education departments, aim to redefine the role of the arts during periods of transition and social change by connecting communities, artists and activists to generate responses to pressing social issues.

p.106

70. While it is tempting to think of institutional specialisation
in terms of the organisation's geographical location,
this cannot be the only parameter for determining
institutional focus. Just as with the internet, metaverse
environments allow for communities to come together
regardless of geographical proximity to one another.
This does not mean that cultural institutions should lose
their geographical community focus—but whether or
not that makes sense for a particular organisation is a
question of whether it has the capabilities to deliver
valuable engagement to these communities.

71. A report by Alana Kushnir, Principal Investigator of
Serpentine's Legal Lab and Founder of Guest Work
Agency, in collaboration with Amurabi, on the legal
issues experienced when collaborating across art,
science and technology will be published on 6 July
2021. Link: https://bit.ly/2Se8jNP

72. For a discussion on the role of 'permissive IP' in
returning value to creators and communities on
the metaverse, see Jay Springett's 'Permissive IPs'.
Link: https://bit.ly/3wBlKXc

Image credit: P.87-88 *Beech* Tree Collection (Fagus
Sylvatica) by jimd on TurboSquid, 3D Model License
(Standard). Link: https://bit.ly/3gDsA8U
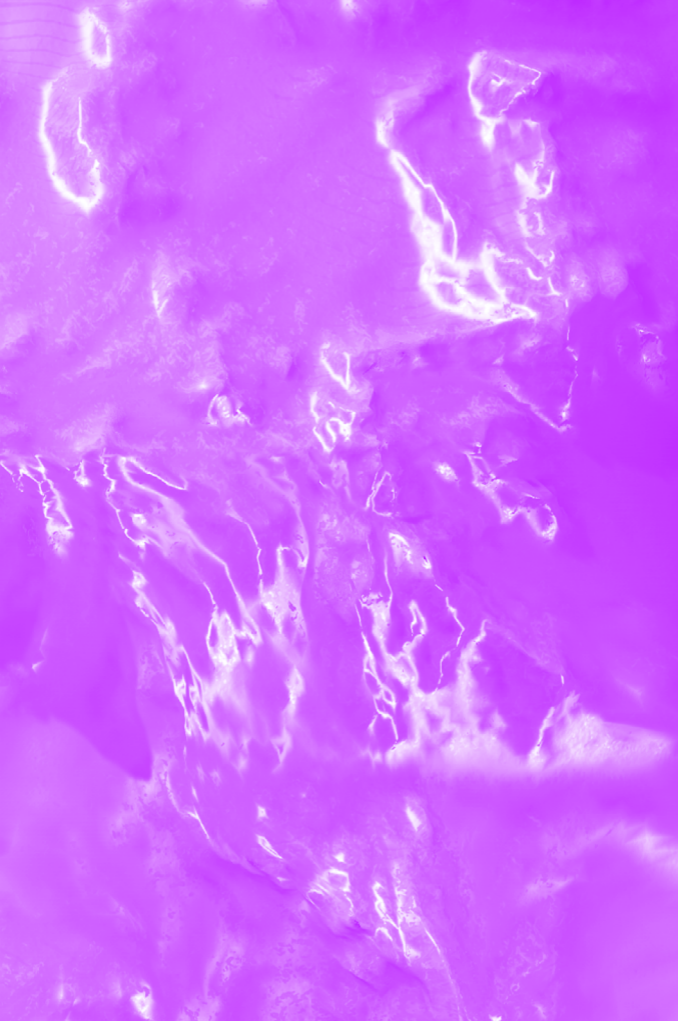
Postface

Inspired by the belief that art and artists are crucial agents in shaping society, Future Art Ecosystems builds on Serpentine's support of artist-led experimentation with advanced technologies through artist commissions and research.

Serpentine is proud to be part of a constellation of organisations committed to building bridges between art, science, technology and policy. Now, more than ever, the global health emergency compels us to reflect on and evaluate existing paradigms of art institutional digital departments—and how they must be rethought to become nodes of art ecosystems capable of nurturing relevant and impactful work for the 21st-century and its challenges.

119

FAE2 offers an ambitious proposal—to assess how individual organisations can contribute towards the emerging landscapes of the metaverse, and to develop stronger ties between organisations in order to foster meaningful and lasting interventions.

We would like to thank Marta Ferreira de Sá and Benedict Singleton of Rival Strategy, Roxy Zeiher, Sarah Shin and Luke Caspar Pearson for their contributions in shaping this briefing.

Finally, we would like to express our gratitude to Serpentine's Arts Technologies team: Alex Boyes, Tamar Clarke-Brown, Victoria Ivanova, Eva Jäger, Ben Vickers and Kay Watson.

120

Bettina Korek, CEO
Hans Ulrich Obrist, Artistic Director
London, July 2021

Contributor
Biographies

Larry Achiampong
is a multimedia artist whose solo and collaborative projects employ imagery, aural and visual archives, live performance and sound to explore ideas of cross-cultural and post-digital identity.

Mark Atkin
is a curator, producer and director at XO Labs, immersive media specialists and experts in the curation and creation of cutting-edge projects that combine technical innovation and storytelling.

Fin Bar
is the Managing Director of Off World Live, a company that develops tools for live-streaming from game engines.

122

Black Shuck
is a co-operative that works together with artists, companies and cultural institutions to produce projects. It is run by its members who consist of freelance artists that offer a wide range of skills and experience.

David Blandy
is a multi-disciplinary practitioner reimagining our relationship to the world through performance, video, installation, roleplay and collaborative practices. Making links between geopolitics, the struggle of decolonisation, the ecological crisis and the self in an age of digital dematerialisation, Blandy takes a playful approach to lure viewers into structural and personal analysis.

Danielle Brathwaite-Shirley
is an artist, animator and archivist creating work that centres Black Trans people.

Alenda Chang
is Associate Professor in Film and Media Studies at University of California, Santa Barbara and the co-founder of Wireframe, a digital media studio fostering creative pedagogy, research, and design aligned with issues of social and environmental justice.

Cade Diehm
is a systems theorist, anti design ethicist, strategist and founder of the New Design Congress, a non-profit organisation developing a nuanced understanding of technology's role as a social, political and environmental accelerant.

Contributor Biographies

ENGINE
is a virtual studio space and think-tank for a small cohort of interactive media artists.

Fantasia Malware
is an artist collective that makes magical, corrupt and chaotic software. The collective includes Gabriel Helfenstein, Jira Duguid and Chloê Langford.

Alex Fleetwood
is a game designer, creative director and entrepreneur. He was Head of Studio at Niantic London and the founder of Sensible Object.

Marie Foulston
is an award winning curator and creative director of exhibitions, installations and experiences specialising in video games, play and digital design and culture.

Liam Hamill
is Brand Lead, Unreal Engine at Epic Games.

Merel van Helsdingen
is Founder and Managing Director of Nxt Museum, the first museum in the Netherlands dedicated to new media art, opened in Amsterdam in August 2020.

Joey Holder
is a multimedia artist and researcher who produces work exploring the limits of human and non-human experiences, natural and technological forms, and organic versus non organic processes.

Sallyann Houghton
is Business Development for Epic Games, specialising in the Fashion Industry and part of its Innovation Lab in London.

Kadine James and Lucy Wheeler
are founders of The Immersive Kind, a creative technology studio and digital arts platform.

Gabrielle Jenks
is a curator, producer and Digital Director at Manchester International Festival.

Rindon Johnson
is an artist and writer whose multidisciplinary art practice explores themes of identity construction and global socio-environmental concerns.

Natalie Kane
is a curator, writer and researcher specialising in digital design art and technology. She is currently Curator of Digital Design at the Victoria and Albert Museum and one half of curatorial research project Haunted Machines.

Keiken
are a cross-dimensional collaborative artist collective that includes Hana Omori, Isabel Ramos and Tanya Cruz.

Kei Kreutler
leads strategy at Gnosis, a network of teams building the web3 software stack for decentralised organisations (DAOs). She also contributes to the Other Internet research group and sits on the Board of Regen Foundation.

Jay-Ann Lopez
is CEO and Founder of Black Girl Gamers, an online safe space and platform that heightens the visibility of Black Women in gaming and advocates for diversity and inclusion.

Trevor McFedries
Trevor McFedries is co-founder of Brud, founder of crypto community Friends With Benefits, and co-creator of the first computer-generated social media influencer, Lil Miquela.

Robin McNicholas
is co-founder and Creative Director of Marshmallow Laser Feast.

Evelyn Mora
is an entrepreneur, strategist, sustainability consultant and founder of Digital Village.

Nick Murray
is a producer, composer and artist making interactive sonic and narrative work focusing on loss and digital cultures that often takes the form of games, interactive poetry and performance.

Andie Nordgren
is the Director of Live Platforms at Unity Technologies and ex-EVE Online Executive Producer at CCP Games.

Pete Jiadong Qiang
is Curator at X Virtual Museum.

Chella Ramanan
is a writer, game developer and narrative designer and co-founder of 3-Fold Games and POC in Play.

Sam Rolfes
is an artist and director at Team Rolfes who uses a variety of experimental technical workflows across visual art, performance, design and music.

Veronica So
is a producer working across art, technology, gaming and animation, and for the last six years has been the producer and co-parent of fine artist Ian Cheng's live simulation and AI work.

Lucy Rose Sollitt
is a curator, writer, strategist/philosopher and artist mentor focusing on the intersection of art and technology and possibilities for new art economies, all from the perspective of art as felt knowledge.

Space Popular
is a multidisciplinary design and research practice led by Lara Lesmes and Fredrik Hellberg.

Jay Springett
is a consultant, strategist, and writer. Currently specialising in distributed web, metaverse, and world running.

Dr Jo Twist OBE
is CEO of UKIE, the industry body that represents and advocates for gaming and interactive entertainment within the UK.

Werkflow
is an experimental digital arts studio working across art, film, fashion, music and gaming that was co-founded by James B. Stringer and Tom Wandrag.

Amelia Winger-Bearskin
is an artist, Banks Family Preeminence Endowed Chair and Associate Professor of Artificial Intelligence and the Arts, at the Digital Worlds Institute at the University of Florida and the host of Wampum.Codes, a podcast that focuses on ethics and value driven software development.

Poppy Dongxue Wu
is Chief Curator at X Museum.

Robert Yang
is an academic, artist and indie video game developer focusing on queer identities, intimacy, and digital architectures in video games.

Yarden Yaroshevski
is the founder & CEO at StikiPixels, the start-up behind Occupy White Walls.

128

Advisor Biographies

Ivaylo Getov
is an Interactive Producer/Director and Media Artist
specialising in technical direction, interaction design,
and software development.

Sophie Netchaef
is a curator, gallerist and writer interested in gallery ecology
and strategy for emerging art practices.

Gabrielle de la Puente
is a critic and curator from and based in Liverpool. She
writes about video games on The White Pube, and also
runs OUTPUT gallery in Liverpool City Centre.

Katrina Sluis
is a researcher, curator and educator. For the past decade
she has worked with museums and galleries to support
digital strategy, digital programming and pedagogy.

129

Contributors

Larry Achiampong
Mark Atkin
Fin Bar
Black Shuck Cooperative
David Blandy
Danielle Brathwaite-Shirley
Alenda Chang
Cade Diehm
ENGINE
Fantasia Malware
Alex Fleetwood
Marie Foulston
Liam Hamill
Merel van Helsdingen
Joey Holder
Sallyann Houghton
Immersive Kind
Gabrielle Jenks
Rindon Johnson
Natalie Kane
Keiken
Kei Kreutler

Jay-Ann Lopez
Trevor McFedries
Robin McNicholas
Evelyn Mora
Nick Murray
Andie Nordgren
Pete Jiadong Qiang
Chella Ramanan
Sam Rolfes
Veronica So
Lucy Rose Sollitt
Space Popular
Jay Springett
Dr Jo Twist OBE
Werkflow
Amelia Winger-Bearskin
Poppy Dongxue Wu
Robert Yang
Yarden Yaroshevski

and those who wish
to remain anonymous

SERPENTINE