Future Art Ecosystems

Issue 1. Art x Advanced Technologies

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Produced by

Serpentine R&D Platform
Ben Vickers
Sophie Netchaef
and Victoria Ivanova

Rival Strategy
Marta Ferreira De Sá
and Benedict Singleton

Edited by Robin Mackay

Designed by Mark Hurrell

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Contributors

Carmen Aguilar y Wedge
Alexandra Daisy Ginsberg
Ece Tankal
Holly Herndon
Ian Cheng
Jakob Kudsk Steensen
Jonathan Ledgard
Julia Kaganskiy
Kenric McDowell
Liz Rosenthal
Noah Raford
Rachel Armstrong
Rebecca Allen
Refik Anadol
Takashi Kudo

Special thanks to

Heather Parry
Jay Springett
Mat Dryhurst
Suhail Malik

Serpentine Galleries

Hans Ulrich Obrist

Ben Vickers
Eva Jäger
Kay Watson
Sophie Netchaef
Victoria Ivanova

fae@serpentinegalleries.org

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Foreword

The *art world*, as it is known today, can be understood as an enormous ecosystem. Or, more accurately, as a series of ecosystems, incorporating artists, cultural institutions, funders, collectors and many others.

This publication series is intended for those with an interest in the development of future art ecosystems. Each issue will provide strategic analysis and recommendations in areas where new actors and processes are emerging.

This inaugural issue of FAE focuses on practices that artists are developing in their work with advanced technologies and the

new infrastructure being built around these practices. The view presented here is based on the Serpentine's experience working with artists in the field, as well as ongoing conversations across broader networks as part of the organisation's commitment to sector-convening around art and technology. As discussed in the Afterword to this document, in a conversation between Ben Vickers, the Serpentine's Chief Technology Officer, and Hans Ulrich Obrist, the Serpentine's Artistic Director, the broader context of this work is the long tradition of cross-connections between cultural practitioners and organisations that develop technology. But today, a new generation of artists working directly with advanced technologies is emerging, and analysis of their activities and approaches suggests an urgent need for a long-term strategic vision for art x advanced technologies (AxAT).

Importantly, this must necessarily be a shared vision, because the challenges and opportunities in play are systemic; they extend beyond the interests of any one cultural institution, tech corporation,

government agency or other individual actor in the sector.

This briefing is presented as a way to help communicate and align appropriate responses. Where intelligence reports, trend forecasting documents and related formats are not unknown in the sector, they have tended to concentrate on art market investment; little of a similar nature exists to provide strategic recommendations intended to inform organisational development. This document is the product of many conversations, and deep gratitude is extended to all those who shared their views and insights.

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It's like you are a painter, but
you also have to invent paint.
Takashi Kudo [1]

Introduction

This document is concerned with the future art ecosystems emerging today, as artists begin to devise new approaches to advanced technologies, taking them up as materials with which to work.[2]

Of course, artists may explore the implications of advanced technologies through existing media. They will then do so as part of a broader cultural ecosystem that is already established, even if the subject matter and the work itself may be new. The politics of drone strikes, for example, may be approached through the medium of painting; the industrial manufacture and retail of paint is well understood, as are the processes by which

paintings are hung, stored, moved, purchased and restored. But when an artist works with an advanced technology as a material, there are no such established protocols to fall back on, and the procedures for handling, installing and conserving the work are not self-evident.

Artists working on art and advanced technology (AxAT) projects are always implicitly engaged in technological innovation, albeit with different motivations, approaches and outcomes than those of the industries usually associated with this term.[3] The skills and equipment needed for AxAT projects are largely sourced from outside the contemporary art world: from engineering businesses, the scientific research arena or certain sub-sectors of entertainment such as videogames, the movie industry and theme parks. Culturally speaking, these are all very different spaces from the art world, meaning that they present opportunities for engagement and collaboration, but also the potential for divergence and dissonance.

Institutional legitimacy comes
with reduced appetite for risk.
Kenric McDowell [4]

In the resulting state of flux, with solutions imported and improvised ad hoc to satisfy the demands of each project, new artistic ecosystems are currently beginning to take shape. Many are taking on forms that are not quite those of the art world or those of the tech industry. It is the purpose of this document to provide strategic analysis and guidance with respect to these developments.

This document is largely focused on the infrastructure of the art world; it is concerned less with contemporary art discourse than with what is referred to in this document as the art industry—the set of 'backstage' processes upon which the art world runs. The issues discussed here, however, are not entirely removed from the social and political concerns articulated in contemporary art discourse—for example, critical issues of class, colonialism and climate crisis, all of which present urgent demands on both the development and

deployment of advanced technologies globally.

But if those technologies are to be reconceived and redesigned, such a project could not be launched at a better time than when the systems of the art industry are beginning to be transformed in unanticipated ways. Accordingly, the focus here is upon documenting this destabilisation, along with some of the factors contributing to it (which are often a matter of the relatively practical everyday activities of artists, rather than overt, theoretically articulated intentions), and exploring the possibilities they open up for the formulation of new strategies by a variety of actors.

The Structure of the Document

This document is organised into a series of chapters. Each addresses one aspect of AxAT. The chapters are relatively self-contained and may be approached in any order, although they should be considered together to create a more complete picture.

Chapter 1, Art x Advanced Technologies, describes some of the core features of the artistic practices emerging in this domain. In particular, it identifies certain operational adaptations that cut across many different kinds of technology and types of project: the ability to embrace dynamic materials which change over time; developing new kinds of networks in order to access and work with these materials effectively, as well as constructing narratives that assemble different audiences and collaborators in order to make this possible; the pursuit of success in adjacent fields while maintaining artistic credibility; and an understanding of the art world as a medium—i.e. as one outlet among others for AxAT work.

Chapter 2, Infrastructure for AxAT, documents particular types of infrastructure demanded by these practices, and cases in which various actors—including artists themselves—are now beginning to construct it. Significantly, such moves are often being set in motion by people who are not traditionally responsible for the technical,

financial and operational infrastructure of the art world, or what is referenced here as the art industry. Finding both a lack of support from the art industry as it stands and a new portfolio of opportunities around technology, AxAT is building out an alternative ecosystem through a broad range of infrastructural plays.

To date, however, these plays have largely been deployed in piecemeal fashion. Chapter 3, Strategies for an Art-Industrial Revolution, documents potential ways in which they may be integrated into much broader strategies that will have far-ranging impacts on the art industry. These strategies configure multiple infrastructural plays into new emergent ecosystems. Three are detailed: the tech industry as art patron; the development of art stacks—artists' studios operating at an unprecedented scale, integrating functions like digital R&D and provision of gallery spaces into their operations; and twenty-first century cultural infrastructure, strategic initiatives to build future art-industrial platforms that facilitate the societal impact of the AxAT ecosystem as a whole.

Notes 1-4

1. Takashi Kudo is the Tokyo-based Global Brand Director for art collective teamLab.

2. As used in this publication, *advanced technologies* includes emerging technologies, which today might include examples such as blockchains, gene editing and machine learning. It also covers technologies that are well established on a technical level and may be culturally familiar to many, but whose long-term implications are still largely unknown. Examples of the latter include social networks, electric vehicles and systems that allow humans to survive offworld.

3. Needless to say, this has always been the case. The work of artists has long been understood to involve both pushing the possibilities of the materials they use and expanding the range of what is seen as an appropriate material—a line that connects traditions of craft practice to the twentieth-century expansion of their palette to include everything from computers to social institutions.

4. Kenric McDowell is Artist + Machine Intelligence program lead, Google Research.

1

Art x Advanced Technologies

New ways of working, that's where the real innovation is.
Jakob Kudsk Steensen [5]

There is a vast range of advanced technologies that might serve as artistic materials, and an even vaster set of uses to which they might be put. But the new practices appearing in response to them have a number of features that are surprisingly consistent. Five are identified here: the embrace of *Dynamic Materials*; the need to engage in *Developing Networks*; a call to engage in *Constructing Narratives*; the pursuit of *Success in Adjacent Fields*; and the perception of the *Art World as a Medium*. All of these have strong precedents in prior artistic practices, but the challenges of AxAT make them more salient today than ever.

I watch my dog sleep. Sleeping is extremely predictable. But every time he switches, or he wakes up to change position, it's like a miniature revelation. And I always wanted to capture that energy in artwork.
Ian Cheng [6]

Dynamic Materials

Advanced technologies are lively materials. They often enable works that are interactive, and that may also evolve, either by storing and processing audience interactions or through their own internal logic.[7, 8] Such works may also be connected to the external environment, liable to change in response to events outside the exhibition site.[9] They will often have an experimental quality, in that their moment-to-moment behaviour is difficult to predict. Anything might happen—or nothing at all. A virtual world may transform unexpectedly. An exhibited biological system could literally die.

The materials used may also be in a state of flux. Technologies can often take decades to reach their definitive shape, and it can be safely assumed that fields such as VR will continue to develop over a substantial period of time, during which experimental cultural projects will play a part in helping establish

their mature form. Meanwhile, they may also be operating in a relatively undetermined context, up to and including having a complex or unclear regulatory or legal status, as with synthetic biology, aerospace, blockchain technology and autonomous organisations.[10, 11, 12] This implies that the general instability of these technologies also offers a moment of opportunity.

I always start with the story about me being in a garden trying to build worlds in jam jars. I went out with my spoon and tried to put things together in different ways. I was trying to build environments that increase livability, you know, with little worms and spiders. And I was really fascinated by what came out of the ground and that the materials weren't still, they were doing stuff.
Rachel Armstrong [13]

Another significant indication of the importance of dynamic materials is the emergence of the ‘construction of worlds’ or ‘worlding’ as key terms in some artists’ descriptions of their works, where a previous generation might have used the term ‘networks’. Although both terms connote systems that are distributed, time-based and evolving, ‘worlds’ adds to this a sense of the work’s autonomy from the artist; the work now comprises a consistent space which others may ‘inhabit’ in ways they choose, as well as a sense of narrative—the ability of these worlds to capture attention by developing through unanticipated plot twists.[14]

Developing Networks

We are an art and technology company that's focused on providing opportunities for ourselves and for our communities to exercise their voice, their ideas. We do that by fostering a community and working with people who we know have brilliant ideas, who are careful about how technology is being deployed. And we work with a lot of experts in the field in order to bring our ideas to fruition.
Carmen Aguilar y Wedge [15]

Advanced technologies tend to be complex in both material and informational terms. It is relatively rare for the required skill sets and knowledge bases to be mastered by a single individual artist. Collaboration with specialists is often a necessity, whether on an individual basis or, as is increasingly the case, 'in-house' as part of artists' studios.[16]

Additionally, funding may come from academic science programmes or tech

corporations as well as from cultural sector sources. People from these non-art backgrounds will also become audiences for the work, with a professional as much as spectatorial interest in its outcomes.

Given the extensive networks required, it is unsurprising that many artists working in this way are from diverse backgrounds, including, for example, training or professional work in design, architecture, coding and other fields that involve both technical skills development and extensive work with non-art-world stakeholders.[17] This kind of background provides both specialised knowledge and experience in working across disciplines far removed from art contexts. At present, an individual's accumulation of such multi-disciplinary skills is a matter of personal happenstance; there exists no educational provision, mentorship programmes or other support for building capacity around these practices.

Constructing Narratives

So, essentially [my practice] started to show that worlds could collide, and […] the research I did was to navigate those, trying to identify which language was appropriate. You can't take things for granted. And you can't expect everything to be obedient.
Rachel Armstrong

The coordination of networks that involve actors with diverse skills, backgrounds, motivations and financial models commits the artist to an ongoing effort to inform and motivate a range of collaborators and/or participants, and to integrate them effectively in order to deliver the project.

This typically means being able to articulate a central project (or area of exploration) in ways that align with diverse expectations, backgrounds and ways of understanding the value of the work as a necessary precondition to engaging with it. It also means expressing

an idea—in various stages of completion—through words, numbers, screens, sketches, prototypes and other media, and in time frames ranging from ongoing deep engagement with a project partner to extremely fast assimilation in a display or pitch environment.

By necessity, then, the artist ends up in part adopting the traditional interpretive role of the critic or curator, who must typically generate variations on a central story about what the work is and what it is ‘doing’—the difference being that the range of disciplines involved here falls outside most current curatorial experience.

Success in Adjacent Fields

The fact that these emerging practices are located on the edge of the art world opens up the prospect of AxAT work gaining traction in other fields and attaining success by their standards—as an ambition, but also sometimes as a necessity, particularly when collaborators who provide resources (from funding to tech access to specialist skills) also bring their own standards of merit to the table. This does not have to mean a direct quid pro quo, such as the demand that an artist conform to the standards of commercial product innovation in return for access to early stage technology; more often the project can be framed as part of a broader public understanding of science or corporate social responsibility programme, for example, or as a learning opportunity for the scientists and technologists involved.

Indeed, this type of coordination of a distributed network will very often make it necessary for a project to succeed in fields

outside of the art world. While individual scientific collaborators, for example, may be motivated by artistic merit or may simply be curious, securing access to capital-intensive resources for projects that don't conform to familiar paradigms of contemporary art often requires broader coordination.

In many cases, these requirements may be grasped as opportunities: beyond the need to construct narratives that translate the work for different participants, success across fields can become a motivation and a goal in its own right. Hence, artists working with advanced technologies are looking beyond the immediate environment of contemporary art and are pursuing tangible impacts elsewhere, for example in setting new standards of technological sophistication.

While, in a sense, this responds to the ambitions of contemporary art to have a direct impact upon society at large, it also raises difficult questions for the art world.[18] For a work to be a success as art and as something else might be more easily accepted in art and

in another field at the same time; the unveiling of a mass-market product as part of an AxAT project may prove less palatable than achieving a social impact through, for example, a legal ruling.

I think we fluctuate between the worlds of design and art. I studied design. I'm firstly an architect. I'm a designer maybe after that, and if I practice art long enough, I'll become an artist.

Ece Tankal [19]

Artworld as Medium

Is it art? We don't know. Maybe it's art. In twenty years, we'll find out whether it was art.
Takashi Kudo

Increasingly, artists working with advanced technologies seem inclined to approach the contemporary art world as one 'medium' among others, the artwork as a 'format' for project outcomes that also exist in other forms elsewhere and the exhibition space as just one 'channel' to present work to a subset of a broader audience.

This is not to denigrate the social role played by contemporary art, or to underestimate its potential. Indeed, the contemporary art world continues to be valued by practitioners as a site for particular kinds of exploration, conversations and knowledge production. It does, however, indicate an inevitable reckoning to come, since proximity to adjacent fields affords practitioners a new perspective from

which they can take stock of the contingent nature of art world norms and mores in the light of alternative approaches.[20]

All of these features of emerging AxAT practices point toward a growing disparity between established art world practices and the attitudes and requirements of artists working with advanced tech. However, the most crucial significance of AxAT practices lies in their potential impact upon the infrastructure of the art world—the challenge they pose to the art industry.

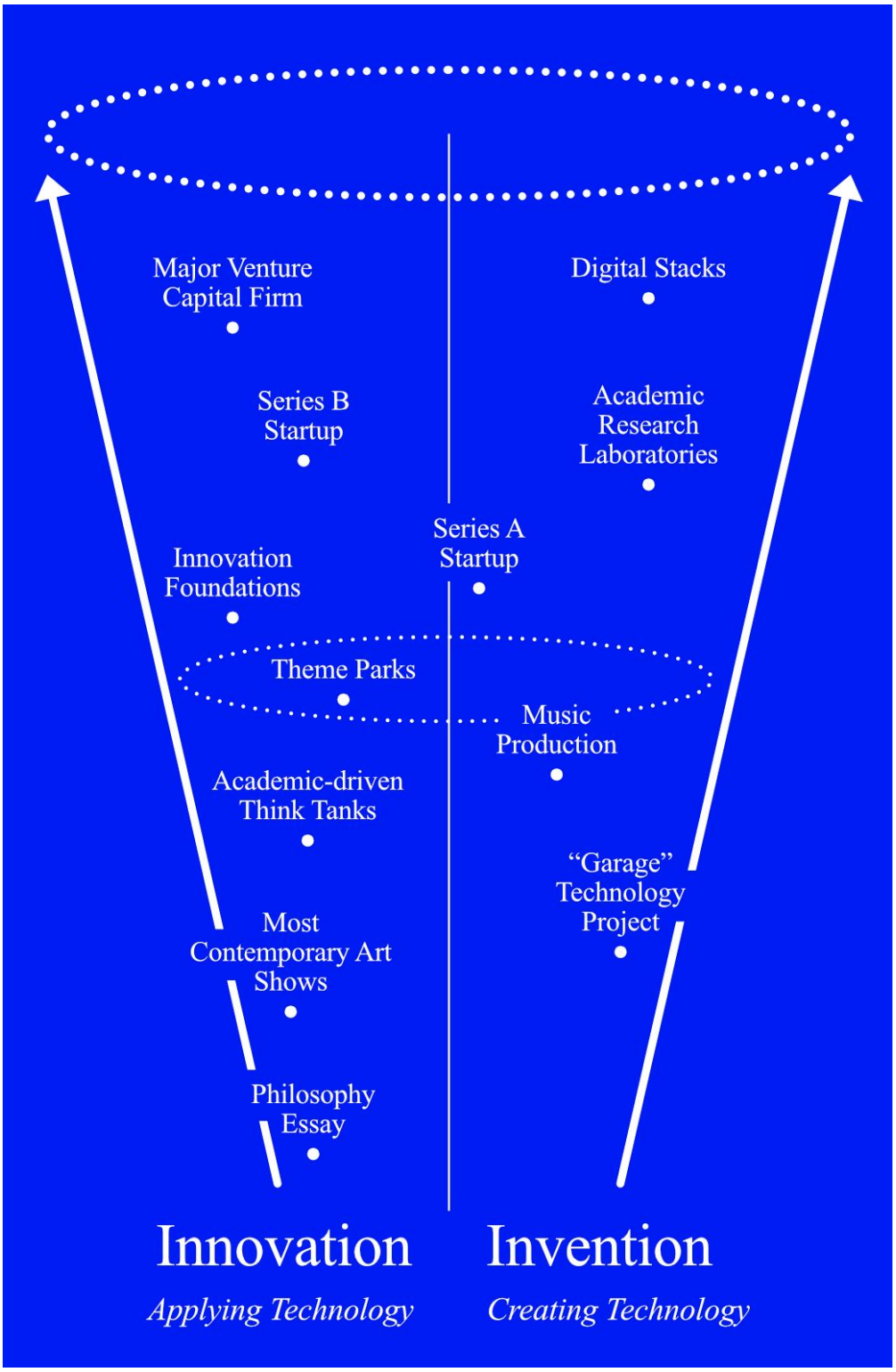

Figure 1. Proximity to impact on everyday life of systems to apply existing vs originate new technologies

Notes 5-20

5. Jakob Kudsk Steensen is a Danish artist and art director, known for video and augmented/virtual reality installations.

6. Ian Cheng is a US-based artist known for advanced work with simulations.

7. It is common for AxAT artworks to change form due to programmed or algorithmical responses to uncontrolled stimuli, data or inputs.

8. For example, a machine learning system in a gallery, a microbial culture or an advanced simulation.

9. For example, systems connected to a real-time sensor network somewhere else in the world, or to online events.

10. Synthetic biology currently sits in a regulatory grey space in the UK, where the government is concerned about the field but doesn't necessarily know if or how it might intervene.
Link: bit.ly/3a3r22A

11. In 2018 Trevor Paglen launching a sculpture into near-earth orbit triggered a wave of criticism from astronomers and other science professionals.
Link: bit.ly/2QJznAT

12. Artworks exploring blockchain technology and futures markets especially operate in uncertain conditions with respect to global financial regulations.

13. Rachel Armstrong is Professor of Experimental Architecture at Newcastle University.

14. Worlds largely differ from networks as a creative material by using a cast of synthetic actors as inputs rather than external participants or data sources.
Link: bit.ly/2TfG9ju

15. Carmen Aguilar y Wedge is a Co-founder and Director of Experience Design at Hyphen-Labs.

16. To create their AI music platform, Spawn, musician Holly Herndon and producer Mat Dryhurst worked extensively with developer Jules Laplace.
Link: bit.ly/2Rc1VlC

17. Artist Ian Cheng studied cognitive science and worked as an animator at Industrial Light and Magic before moving into art. Hyphen-Labs was founded by an architect and a civil engineer. Rachel Armstrong's synthetic biology projects build on her experience in both medicine and architecture.

18. As evidenced in the UK, for example, by the Arts Council's ongoing emphasis on the link between art, mental health and wellbeing, or the prominence of socially active groups such as Assemble and Forensic Architecture on the Turner Prize shortlist in recent years.

19. Ece Tankal is a Co-founder and Creative Director of Hyphen-Labs.

20. In late 2019, music critic Simon Reynolds introduced the term *conceptronica* to articulate a trend in the previous decade for electronic musicians to successfully diversify into the contemporary art field; *'Fluent in the critical lingua franca used in art institutions and academia worldwide, conceptronic artists know how to self-curate: they can present projects in terms that translate smoothly into proposals and funding applications. Which is handy, because what sustains these artists is not revenue from record releases but performances on an ever-growing international circuit of experimental music festivals, along with subsidised concerts at museums and universities. Often trained in the visual arts rather than music theory, conceptronica artists increasingly resemble a figure like Matthew Barney, whose work involves multiple media and is staged on a grand scale, more than IDM pioneers like Autechre, whose focus has always been overwhelmingly on sonic experimentation'*
Link: bit.ly/30dp0Zp

2

Infrastructure for Art x Advanced Technology

The Art Industry

The term ‘art industry’ is used here to designate that part of the art world in which cultural projects are developed, produced and financialised, and their outputs distributed, stored and protected. The art industry thus comprises the ‘backstage’ elements of the existing contemporary art ecosystem. Artists, curators and cultural institutions regularly transit between the public facing aspects of the art world—where art is presented and discussed—and the art industry, but the latter includes many practices that remain unseen by audiences, such as insurance practices, security arrangements and freight logistics.

The art industry can operate in ways that are often quite different, indeed opposed, to the stated intentions and interests of artists themselves, even as it provides a matrix for their work. As such, it has frequently attracted critical commentary from artists and art theorists, a tradition that shows no sign of

abating today.[21, 22] The persistence of such critique is due in large part to the fact that, while the art industry continues to evolve, this evolution is primarily shaped by factors largely indifferent to calls for reform on the part of the public-facing art establishment.[23] Put bluntly, the art industry has proved far more responsive to emergent investment opportunities than it has to critique from artists and others.[24]

AxAT practitioners often share these critiques of the contemporary art industry, but in addition they create connections into other fields and require new kinds of infrastructural support. As artists and their networks confront the challenges of AxAT, then, they are coming up against the existing limitations of the art industry. And crucially, in response to these limitations, they are not seeking to reform the art industry, but to augment certain aspects of it, to supplement it with entirely new functions or to route around it entirely.[25]

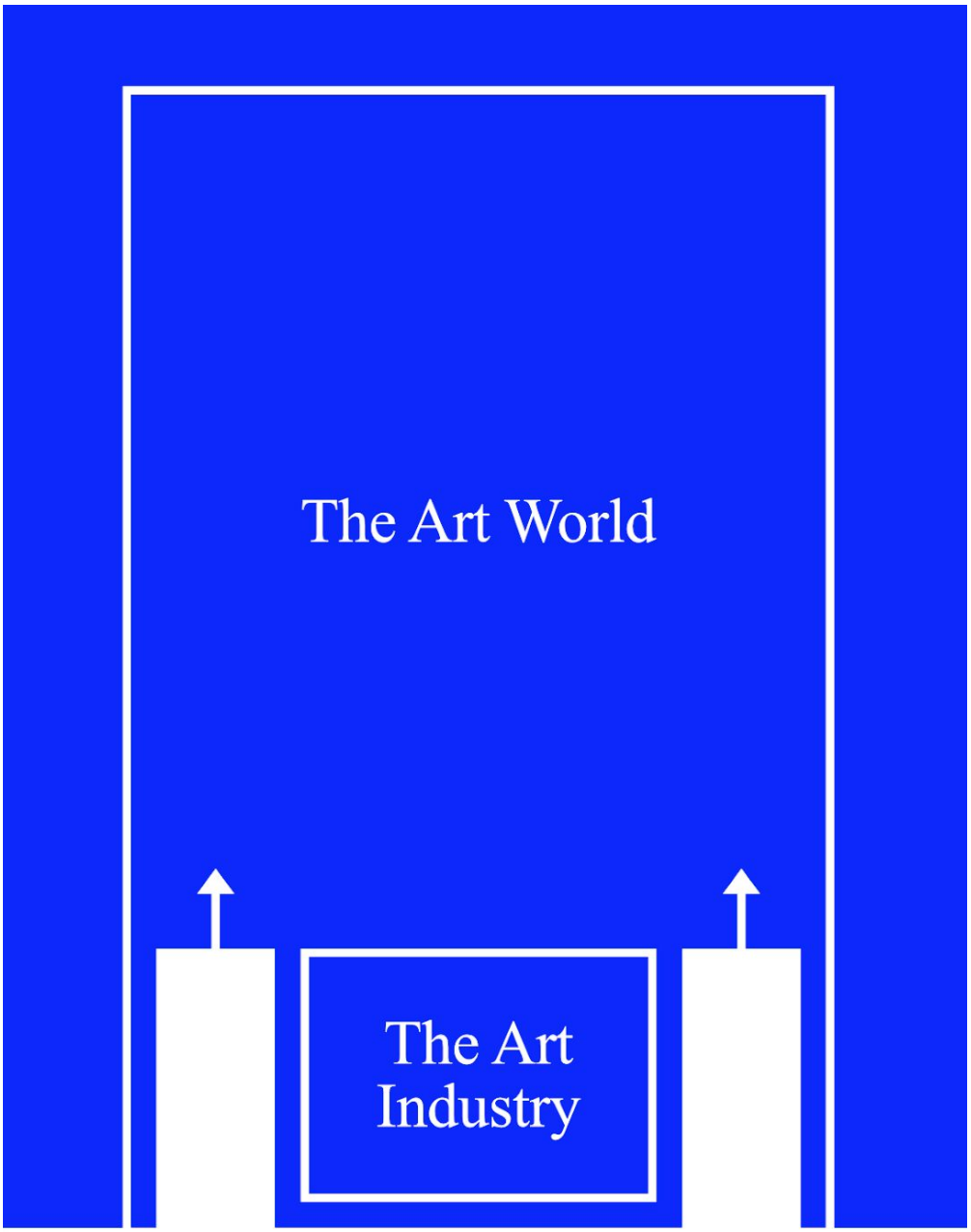

Figure 2. Art-adjacent status of infrastructural plays (space & time, products & services, skills & resources), partly intersecting with the art world and art industry, partly existing outside of them.

Infrastructural Plays

These initiatives by AxAT artists and the networks around them can be understood as new infrastructural plays, a selection of which are described below.[26] Many of these plays are not entirely novel, but draw inspiration from art and adjacent fields, in particular the tech business, digital and product design and the entertainment industry. This creates complications and risks, but also opportunities.

The plays described here comprise a loose and informal ecosystem, involving many different actors and agents around the world.[27] The next chapter will discuss strategies that might consolidate multiple plays into genuine future art ecosystems, by building robust and meaningful links between them. Initially, however, this list contains a number of the most significant infrastructural plays, organised in terms of the needs they provide for. Specifically, AxAT projects need the appropriate *Space & Time* to both develop

work and share it; the *Skills & Equipment* required to work with advanced technologies; and the ability to devise *Products & Services* that will enable AxAT practices to be financially viable.

Infrastructural Plays

Space and Time

The need for suitable spaces and adequate time periods in which to both develop and show work.

There are about two days a week I say I wish I was a painter; [with galleries and museums] as soon as you have to plug something in, it becomes complicated.

Alexandra Daisy Ginsberg [28]

Dedicated display spaces

Architectural environments designed to exhibit AxAT projects

AxAT projects can present non-trivial challenges with regard to display in the space of a gallery, museum or other public setting. For example, immersive digitally-controlled environments may require UHD displays and projectors, dynamic lighting, bandwidth, computational power, robotics and interactive interfaces. All are resource-intensive in terms of capital outlay and the skills required for installation and maintenance. Evidently, not all AxAT projects require this level of investment, and one workaround is to use more conventional formats such as film or other pre-recorded media, although this can restrict the more interactive and dynamic aspects of the work.

Deep use of online spaces

New, increasingly sophisticated engagements with the potential of digital works to inhabit online spaces

While there is already a substantial history of individual works and 'exhibitions' being presented online, with or without interactivity, AxAT projects are pushing the envelope of what the online presence of an artwork or exhibition can be.

One example is the *Åzone* exhibition curated by Troy Conrad Therrien for Guggenheim NY (2015), which took the form of an online prediction market in which plausible future scenarios, devised by a large group of artists, writers and others could be traded for a virtual currency, with the intention to crowdsource the likelihood of their future occurrence.[29]

This exhibition enabled the active participation of an anonymous global public, and is significant less for its erasure of boundaries between exhibition and piece, or

its delocation of the art work across a global landscape through online distribution (both familiar themes from earlier online art) than for its blurring of art, speculative financial markets and policymaking systems.

When I started the Design Media Arts department at UCLA, the idea was not to just use technology that was out there but to try to create new generations of artists who could think about technology more deeply and were familiar with the use of it. The more I felt that more artists were in that position, the more technology could be defined and the ideas could be explored and enhanced.
Rebecca Allen [30]

Collective spaces

Sites that enable AxAT practitioners, whether as individuals, collectives or companies, to work alongside one another.

Examples include Trust in Berlin (2017–present), organised by Strelka alumni, and the NEW INC incubator at the New Museum, New York (2014–present).[31] Such spaces enable AxAT artists to be exposed to and to create connections with others working in related domains, and to join with them in facing shared challenges at the level of the common features of emerging practices outlined in Chapter 1.[32]

Multidisciplinary courses

Settings for skill acquisition, network development and teaching engagements for AxAT practitioners.

Historically, university departments such as MIT Media Lab (1985–present) and courses such as the Design Interactions MA at the Royal College of Art, London (2006–2015) have provided fertile ground for this type of work.[33] Often founded within a design context rather than a Fine Art tradition, these ventures have aimed to integrate design, science, tech and art together with societal questions about the implications of advanced technologies. The New Normal (2016–2019) and Terraforming programmes (2019–present) at Strelka Institute, Moscow, are exemplary of how transformative this infrastructural play can be. Hosted by the think tank branch of a large-scale urbanism consultancy, and offering a five-month fully funded diploma rather than an accredited degree, programmes such as Strelka's sit between research fellowship, postgraduate course and arts residency.

NEW INC., for me at least, was envisioned as a community-led inquiry into how we could find ways to build either individual or group organisations around creative work that would be consistent with our values. We were playing with this idea of the incubator model, which is so prominent these days in Silicon Valley, and being exported all over the world—to think about how the incubator might be repurposed or reimagined in a cultural context. And with a different definition of success that allowed for more multiplicity than does the typical growth-oriented model of startups.

Julia Kaganskiy [34]

Tech residencies

Schemes to undertake an artistic residency with a technology company.

A number of residency programmes operated by tech companies offer artists access to advanced technology and the skills and experience of engineers and researchers. An established example includes the artist residencies hosted by Google Arts & Culture, including the Artists and Machine Intelligence group.[35, 36]

Skills and Equipment

The need for access to
advanced technology and the
skills with which to deploy it.

AxAT projects frequently require artists to work with technologies that have high barriers to access—equipment that may be some combination of complex, expensive and highly specialised—and to acquire the skills with which to use it.

This group of infrastructural plays involve bringing artists together with the appropriate materials for their work.

Right now I'm going to be using a grant from Google AMI so I don't have to build a whole graphics engine, because I just use something like Unity and some other software they can provide, dealing with machine learning and behaviours.
Rebecca Allen

Technology provision

Arrangements to provide support and equipment for a specific project.

An example would be Refik Anadol's *Machine Hallucination* project (2019), first shown at ARTECHOUSE in New York City. The project involved downloading 213 million publicly available images of the city and distilling from this set into nearly 10 million images without human beings, before processing them using the artist's adaptation of the NVIDIA StyleGAN algorithm.[37]

The requisite processing power was provided by an NVIDIA DGX workstation, a piece of hardware well beyond the typical budget for an artwork.[38]

When we were working with VR, the computers and headsets were inaccessible. But now the technology is becoming cheap enough that people can develop their own. And also the free software is usable, and people are able to design in it.
Carmen Aguilar y Wedge

I made a decision early on in my simulations to work in a videogame platform called Unity. It's really beautiful, in part because it's such an all purpose videogame engine that can be supported by many different platforms—iOS, PlayStation, Xbox PC, Mac. And when doing these exhibitions, typically it's just hardware like an iMac.
Ian Cheng

DIY approaches

Development of capabilities to work with advanced technologies without mediation from other parties.

Technological equipment and technical skills relevant to AxAT may be concentrated in tech companies, but they are also found outside of the tech industry. Increasingly sophisticated technologies have matured to the point of being accessible through consumer markets; the corresponding skills are also widely available, as is support for skills acquisition.[39] It is possible to create conceptually advanced AxAT projects with such resources. There is also a large pool of technologies that may be accessed at low or no cost that represent cutting-edge applications of emerging tech, albeit with a relatively high amount of skill required to use them.[40] These both enable artistic practices and provide a basis for bottom-up collaborations with developers, engineers and other specialists outside of 'formal' tech development organisations.

[My studio's work] is about crafting machine intelligence. So we have neuroscientists, an AI engineer, a data scientist and an architect. This model is very fresh, I believe, in the arts.
Refik Anadol [41]

Integrated studios

The predominance of the studio model and its incorporation of new skill sets.

As indicated in Chapter 1, distributed networks are immanent to the AxAT model, as few people will possess all of the skills to work with advanced technologies alone. In many cases, the requisite expertise is being brought 'in-house', formalising collaborations into studio models.[42] While artists' studios are hardly a new phenomenon, these studios are incorporating a wider range of skill sets than in the past, including, for example, programmers and scientists without a background in the arts. These studios may be organised according to different legal and operational models, depending on the motivations, ambitions and revenue streams underlying them.[43] Rather than associating AxAT with an individual artist, they present an emerging standard of collective action, as indexed by their common adoption of impersonal labels rather than individual names.

If you ask people who made Star Wars, they say George Lucas. If you ask them who made Toy Story 4, they say Pixar.
Takashi Kudo

New patterns of communication

Development of a new way of speaking about artistic work and avenues to communicate it.

The contemporary art world has a particular kind of dialect when it comes to describing, contextualising and promoting work.[44] Some AxAT practices, with their strong multi-disciplinary focus, have sought to craft new concepts to articulate what is at stake in these artistic projects in accessible language, rather than drawing on the historical language of 'art writing' or restricting themselves to technological, academic or scientific vocabulary or styles.[45]

Products & Services

The products and services that
emerge as new financial mechanisms
to support AxAT practices.

AxAT projects can be capital-intensive to a degree that places them beyond the reach of all but the most heavily-funded current practices.

But artists engaged in them can—through their deployment of technology—place themselves in a position to access means of funding quite different from their contemporary art peers.[46]

Ticketed experiences

The development of ticketing models for specific art 'experiences'.

The spectacular nature of some advanced technology projects, especially those based around immersive digital installations, synchronises well with direct payment mechanisms.[47] Extremely popular installations by artist studios such as Random International, teamLab and Studio Drift are testimony to the compatibility of this model with touring exhibitions hosted by existing cultural institutions, as well as their existence in dedicated display spaces.[48, 49, 50]

Many artists in this field come from a background where mass distribution creates value. Value in digital media is created through mass distribution and shareability, the antithesis of how value is recognised in the art world, through a model of scarcity. We're seeing a variety of emerging models using different platforms and venues that experiment with these two different value systems.

Liz Rosenthal [51]

Building tools

The creation of tools for others to use.

As part of working with advanced technologies, artists are developing tools for themselves. But these tools are being developed in the course of specific artistic projects rather than being designed with a broader selection of users in mind, and what works within one practitioner's technical set-up may not be easily integrated into another's.

However, there are exceptions—for example, the artist James George's co-creation of Depthkit, now the most widely used volumetric capture system for AR and VR, or Burak Arikan's Graph Commons platform for the mapping and analysis, and publishing of data networks.[52, 53] Such plays may attract funding directly from investors and in principle may scale hugely, but at present they remain rare.[54, 55, 56]

Byproducts as assets

The derivation of revenue from other parts of the AxAT project development process.

The development of advanced tools is a special case of a more general phenomenon: the production of saleable byproducts of advanced-tech practices. This is starting to be deployed as an advanced-technology play in neighbouring fields.

For example, in 2017, film director Neill Blomkamp created Oats Studios, an experimental movie studio that created short, high-budget films with a strong visual FX presence. These were to be released for free, with the revenue stream coming not from ticket sales, distribution deals or marketing opportunities (e.g. YouTube advertising revenue), but rather from the sale of CGI assets to games developers via the Valve platform.

In this case, a byproduct of the creative project process was identified and financialised,

creating a mechanism to route around existing actors (e.g. movie production houses, financial backers) that dominate the Hollywood ecosystem. Analogous situations may emerge in many kinds of AxAT art.

Art products

The mass-marketable product as a format for artistic work.

Editions, show-related merchandise and other spin-offs from artistic production have become a familiar revenue stream, especially for established artists (and especially in collaboration with galleries and museums, for whom gift shops may provide a substantial source of revenue).[57] However, advanced technologies have the potential to more directly link technical expertise and thematic content developed in an arts setting with a product design cycle. An example is Studio Olafur Eliasson's *Little Sun*, which as of December 2019 has sold over a million units.[58] *Little Sun* was designed by artist Olafur Eliasson and engineer Frederik Ottesen, and was launched at London's Tate Modern, with revenue funnelled through a social business model whereby for each sale in a museum or online, another unit is delivered to an off-grid location, most of which are in Sub-Saharan Africa.

Art as research

AxAT's integration into academic research funding.

There is a longstanding connection between the art world and the academy, especially in the humanities, and various 'practice as research' frameworks enable artists to situate their work in this context as a generator of research outputs. The utilisation of advanced technology as a material, however, means that art practices are also able to resituate themselves with respect to science and engineering departments, and to broker engagements by those departments and other fields. This can, however, happen in multiple ways—for example, as part of 'public understanding of science' initiatives attached to highly-funded scientific programmes.[59] More directly, the work of AxAT artists can directly draw on funding for scientific research and technological innovation, for example Rachel Armstrong's co-ordination of the €3.2m *Living Architecture* project.[60]

Cross-connections

The deployment of work in adjacent fields, with corresponding alignment to non-art-world financial mechanisms.

The possibility of success in adjacent fields when working with advanced technologies creates opportunities to fund and distribute work directly, through non-art-world mechanisms. One example would be the showing of VR and AR work at film festivals, or its online distribution through dedicated consumer platforms.[61]

New purchase mechanisms

Artist-initiated innovations in how art is bought and sold.

AxAT practitioners tend to have a great deal of familiarity with the commercial models prevalent in the other fields with which advanced technology connects them. A number of AxAT practitioners have experimented with developing systems to buy and sell art in new ways, particularly digital art. Blockchain projects occupy much of this space at present. Among many others, examples of these initiatives include Left Gallery, co-founded by artist Harm van den Dorpel, which sells 'downloadable objects' with ownership registered on a distributed ledger, and the Crypto Certs fundraising programme by artist Ed Fornieles.[62, 63] Notably, many of these examples dis-intermediate gallery representation and collectors, and instead express an interest in collective ownership, but also maintain a focus on a singular artwork or limited-edition run.

Notes 21-63

21. Tate define Institutional Critique as work which attacks art institutions aesthetically, politically and theoretically.
Link: bit.ly/3b7S6yf

22. A recent analysis of this tendency is Beti Žerovc's research on the conflicting agendas managed by, and embodied in, contemporary curators.
Link: bit.ly/2RUdjEx

23. For more detail, read Andrea Phillips and Suhail Malik's *Tainted Love; Art's Ethos and Capitalization.*
Link: bit.ly/2R5jbcp

24. On e-flux journal, Nika Dubrovsky and David Graeber summarised;
'The easiest way to measure the stubborn centrality of such structures, perhaps, is to consider how difficult it is to get rid of them. Attempts are always being made. There always seems to be someone in the art world trying to create participatory programs, explode the boundaries between high and low genres, include members of marginalised groups as producers or audiences or even patrons. Sometimes, they draw a lot of attention. Always in the end they fade away and die, leaving things more or less exactly as they were before.'
Link: bit.ly/2NfyQEK

25. While this is a quality of AxAT generally, it has perhaps been made most explicit with respect to artistic blockchain projects, given their proximity to financial engineering, proof of provenance and other phenomena highly relevant to the art industry. See, for example, the first report from the DAOWO programme:
Link: bit.ly/36UFV4E

26. 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*.

27. The infrastructural plays contained in this publication do not provide a comprehensive survey—a difficult task in a field that is still very much in development. They do, however, aim to articulate some of the major categories of play in this landscape, and to furnish them with concrete examples.

28. Alexandra Daisy Ginsberg is a London-based artist known for pioneering work in emerging technologies.

29. Prediction markets are *'exchange-traded markets created for the purpose of trading the outcome of events. The market prices can indicate what the crowd thinks the probability of the event is'.*
Link: bit.ly/35Nb61c

30. Rebecca Allen is a US-based digital art pioneer.

31. Trust is a Berlin-based incubator for artists, designers, technologists, ecologists and thinkers.
Link: bit.ly/2tPJviN

32. Collective spaces give a certain degree of geographical grounding to distributed networks, which is desirable despite appearing counter-intuitive given the digital focus and expertise of many AxAT practices.

33. Prior to being renamed *Design Interactions*, the Royal College of Art course was known as the *Interaction Design Department*, and before that *Computer-Related Design*.

34. Julia Kaganskiy is a curator, editor and producer, and the Founding Director of NEW INC at the New Museum, NYC.

35. Google describe *Arts & Culture* as *'an artist-in-residency exploring synergies between technology, art and fashion'*.
Link: bit.ly/2FGIvQM

36. Google's *Artist and Machine Intelligence* programme supports artists with training, mentorship and funding to create artwork relating to machine learning.
Link: bit.ly/35M9Zic

37. StyleGAN is an open-source machine learning project from NVIDIA for generating images.
Link: bit.ly/2QLgrSq

38. At the time of writing, the NVIDIA DGX-1 workstation retails for around $150,000, the state-of-the-art DGX-2 for $400,000.

39. Low-cost online courses and free support are available for learning most programming languages, graphics applications, etc.

40. Google freely provides the open-source TensorFlow programming language and learning resources for machine learning applications for anyone to use.
Link: bit.ly/30mBzln

41. Refik Anadol is a US-based artist, known for extremely large-scale and sophisticated uses of machine learning.

42. teamLab, Studio Drift, Random International and Forensic Architecture are all examples within this publication of collaborative processes being formalised into studio models.

43. Alternative art studio models are starting to encompass partnerships, limited liability companies and various species of non-profits or social interest organisations, depending on location.

44. Critical analyses of how the art world describes and contextualises work include Alix Rule and David Levine's description of *International Art English* as the distinctive style of the art-world press release; and the linguistics work of Martin Turpin and team at the University of Waterloo, *Bullshit Makes the Art Grow Profounder*.
Links bit.ly/2FIIdZz and bit.ly/2TcnF3o

45. AxAT art projects that reject the stylings of art writing in favour of accessible language include: *Synthetic Aesthetics*, edited by Alexandra Daisy Ginsberg, Jane Calvert, Pablo Schyfter, Alistair Elfick and Drew Endy
Link: bit.ly/2uGJlur
Forensic Architecture
by Eyal Weizman
Link: bit.ly/37YIl3i
Emissary's Guide to Worlding
by Ian Cheng
Link: bit.ly/2uI8cOF

46. The cost of AxAT projects has particular relevance given that the art industry, as it stands, does an extremely poor job of funding artists directly. One recent survey suggests only 10% of artists can afford to treat making art as a full-time job.
Link: bit.ly/36Rbjly

47. Marc Glimcher, CEO of Pace Gallery, describes the marketability of AxAT works as a direct challenge to the art industry:
'Right now, the general public is not permitted to pay the artists. They pay institutions, which are supported by ultra-high-net-worth individuals, and those institutions bring wealthy people's art to a place where everyone can visit it in exchange for making a small donation. There are no connections between the artist and the public'.
Link: bit.ly/35K0b8z

48. Random International's *Rain Room* was shown at the Barbican, MoMA New York, Yuz Museum and LACMA, where the work was praised as *wildly successful* and *a blockbuster*.
Link: bit.ly/2Rb8Taq

49. Studio Drift's work is held in permanent collections of the LACMA, Stedelijk Museum and the V&A Museum.
Link: bit.ly/2tP9iHJ

50. After touring galleries around the world, *Rain Room* is now permanently on display in a specially constructed building in Sharjah.
Link: bit.ly/2tMA3g6

51. Liz Rosenthal is Founder and CEO of Power to the Pixel, Executive Producer of CreativeXR, VR Programmer of Venice Film Festival.

52. Depthkit is a volumetric filmmaking software tool that allows the user to capture full motion video and depth information to use in interactive 3D environments.
Link: bit.ly/381h4gG

53. Graph Commons is a collaborative platform for mapping, analysing and publishing data-networks.
Link: bit.ly/36Qkv8H

54. Depthkit, though created by an artist, is paid for through substantial seed funding via its parent company Scatter.
Link: bit.ly/36IMBni

55. Another example, digital audio workstation Ableton Live was created by Berlin techno duo Monolake as a patch created in the audio-oriented programming environment Max/MSP in the late 1990s. Intended as a performance tool, it was launched as a separate product in 2001 and is now one of the most widely used pieces of music software in the world.
Link: bit.ly/2TlPoi6

56. Some governments, including the UK, also offer tax breaks for work by commercial companies that can be categorised as research and development, for example the creation of new hardware or software.

57. By some accounts artist editions, show-related merchandise and other spin-offs make up to 25% of established artists revenue.
Link: bit.ly/3a0st1Y

58. *Little Sun* is a compact solar lamp designed for communities with limited access to electrical infrastructure. Buyers in more affluent countries pay more for the lamp as an *artist designed product*, which subsidises the cost for those in developing regions who would otherwise be unable to afford lighting.
Link: bit.ly/3a34Gys

59. There is some debate as to whether 'art-science' is a more useful vehicle for communicating scientific advances, or for exploring the potential of new scientific breakthroughs in the public domain. Regardless, both modes of practice are relevant to AxAT.
Link: bit.ly/2QINfeU

60. Rachel Armstrong's work investigates a new approach to building materials called *living architecture*, which explores making buildings that share the properties of living systems.
Link: bit.ly/2tPZKwh

61. Showing VR and AR artworks at film festivals is common practice and supported by organisations such as Power to the Pixel.
Link: bit.ly/2tQbY7Y

62. Left Gallery produces and sells downloadable objects and merchandise, using blockchain tokens to register ownership.
Link: bit.ly/2QMcAV2

63. Crypto Certs attempts, in Fornieles' words *'to combine financial tools of the art world with the creativity of the financial sector'.*
Link: bit.ly/37X6SFF

For many years I thought technology was trying to catch up to the ideas. And more recently, I feel that the ideas are trying to catch up to the technology.

Rebecca Allen

3

Strategies for an Art-Industrial Revolution

The *infrastructural plays* detailed in the previous chapter tend to be undertaken in relatively local and ad hoc ways. A museum may buy equipment to host an AI project, a tech company may put out an open call for artistic collaborations or an artists' studio may launch a digital product.

This chapter outlines strategies that more overtly draw together multiple infrastructural plays into broader configurations. They involve building substantial ecosystems that support AxAT projects more broadly, providing integrated ways to fund, produce and distribute them. As such, they have both the intention and the potential to create revolutionary shifts, generating new eco-systems of activity that only partially intersect with the current landscape of the art industry.

The strategies outlined here offer frameworks for articulation and cooperation between art, artists and advanced technologies. Each also implies a certain conception of the place and function of art, with implications for how

artists access technology, the spaces in which they present their work, the financial models available to them and the risks involved for those participating in them. The general description of each strategy is followed by a summary of its strategic significance for the various actors involved.

Strategies

The Tech Industry as Art Patron

Art as a source of opportunities
for the technology sector

This strategy builds on a substantial history of large corporations working with artists, especially in the US, and notably centred on the electronics industry and its transformation into the Silicon Valley model.[64] Famous historical examples extend from Bell Labs to Xerox PARC, and have frequently taken the form of programmes that give artists on-site access to technological equipment, technical support and expertise.

Under the terms of this strategy, there is an exchange primarily between the artist and a team working under the auspices of a corporation, typically through *tech residencies* and *tech provision*. Other actors from the existing art industry ecosystem may also be involved, for example museums or galleries.

It's important [with these engagements] that it's not just presenting the approachable, acceptable face of a new technology, where there's no criticality towards [the technology], it's just kind of like a demo. It's like demo art of someone else's tech.
Holly Herndon [65]

A common argument from cultural institutions for brokering these relationships is that artists are working 'upstream' of developments in consumer technologies, with the implication that their work explores opportunities for the application of these technologies.[66] There is a strong historical tradition of tech companies engaging with artists in this way.[67] However, there is no necessary linear relation between these experiments and later product development, and the *tech industry as art patron* strategy boasts a more sophisticated conception of the role of art in relation to industrial concerns. Indeed, it is relatively common knowledge in the tech business that there is no solid relationship between providing spaces for the free exploration of new technology and product development—even

when these spaces come in the form of internal ‘innovation labs’ that do not involve artists whose values may clash with those of the business.[68]

More complex motivations for tech companies to engage with artists can be understood as a portfolio of potential advantages:

1. Organisational learning, from the level of individual employees and teams working with artists, to divisions and global governance. This is effectively the ‘product innovation’ model, but without a linear conception of product development—rather, it places a general value on exposing organisational culture to alternative perspectives on technology and its application, thus challenging assumptions rather than straightforwardly providing ‘solutions’.
2. Domain-specific knowledge and expertise benefiting the usability of emerging technologies. As one example, spatial technologies expanding into areas

that have historically been the domain of fields such as architecture or theatre —there are specific techniques, processes and insights that can be translated to advance the usability of new technologies such as VR, AR and AR cloud.

3. Providing public-facing PR and CSR opportunities, through the exhibiting of specific groundbreaking projects and general 'support of the arts'.[69]
4. Signalling a commitment to innovation to external investors and internal stakeholders.
5. Signalling a commitment to creativity and innovation to prospective (younger) employees in talent pools where hiring is increasingly competitive and for whom workplace values/culture plays an important role in attracting such talent.
6. Providing space for employees to engage in temporary (i.e. full-time but not permanent) or part-time pursuit of their own projects in collaboration with artists, for the purposes of professional development and staff retention.

7. Leveraging the art world, broadly understood as an epicentre of creativity with deep cultural import, as a place to secure a boost for organisational reputations as actors of fundamental importance in contemporary society for a public audience.[70]

Given the diversity of these potential benefits, the *tech industry as art patron* strategy may be seen more as an 'experiment' for the tech company than as a bid for the pursuit of any specific, stated, long-term objectives. Hence, some companies that adopt this strategy do so in the form of an open platform.[71]

It is conceivable that this strategy could extend into creating new venues for commissioned work.[72] However, it also aligns with a policy of drawing on the expertise, reputation and audience of established cultural institutions (an inversion of the 'success in adjacent fields' principle that is one aspect of the *common features of emerging practices* described in Chapter 1). This suggests a deepened relationship between existing art industry

actors and tech companies. However, this strategy also introduces a swathe of new tensions in the interactions between art and tech cultures.

In the first case, it may be that given the fringe relationship of art to its core mission, a tech company may only provide ongoing support to a small number of arts institutions within the same region. Secondly, this support is not necessarily long-term, being subject to shifts in corporate governance and changes in overall company strategy.[73] These factors introduce a degree of turbulence into the art industry, as large-scale economic actors from elsewhere move in and out of the field.

Lastly, this strategy creates complexity in the ambitions and objectives native to the art world and those of corporate policy. The wider actions of large commercial companies may adversely interact with the arts ventures they support on many levels, providing new twists on the ongoing scandals around corporate sponsorship of artistic programmes.[74] The contradiction between economies of scarcity

and the value placed on large-scale operations in industry also creates structural problems, and indeed there are discrepancies at the general level between the cultures of tech and art.[75, 76] It may also be that the low-level operations of these collaborations foster uncomfortable conditions for some artists.[77]

Strategic Significance

For AxAT artists:

access to skills, equipment, and expertise; potential ethical and political risks.

For the tech industry:

exposure to alternative ways of thinking about their technological development pathway, deep historical knowledge and domain expertise in areas that are undergoing technological change—implying a range of associated benefits and risks.

For cultural institutions:

technically sophisticated work to present to the public; a potential collaborator or competitor; potential ethical and political risks.

For private sector investment:

tech industry itself displaces some channels of private sector investment (e.g. collectors), and lowers market circulation; potential investment in spin-offs from larger companies; real

estate development and public-private partnership access points for urban regeneration projects through supporting tech sector/cultural sector interactions.

For public sector investment:

city- or national-level branding/soft power; state role supporting early stage innovation; ability to cross-over tech innovation and cultural sector funding.

Open questions

- What would a museum fully owned and operated by a technology company look like and who would be its audience?
- How far can AxAT projects ultimately impact the development pathway of products, services and platforms within a tech corporation?
- How can much smaller tech organisations be involved?
- What role do governmental or academic science and engineering programmes have to play in the configuration, regulation and nurturing of these new relationships?

Strategies

The Art Stack

Art as the driver of ambitious large-scale projects provided directly to the paying public.

I think artists in general are actually quite bad at imagining how to make their dreams come true at a bigger scale. Bigger not necessarily in terms of grandness, but more complexity.

Ian Cheng

A second strategy is based on the consolidation of both AxAT infrastructural plays and existing aspects of the art ecosystem into a new format: the *art stack*.

Art stacks are artist-led organisations that progressively bring together in-house functions currently distributed between artists, curators, galleries, museums, tech companies and others involved in AxAT projects. The seed of the art stack strategy lies in the need for AxAT artist studios to develop *integrated studios* around *DIY approaches to tech*. The art stack builds on this position by locating a revenue stream —one that gives it autonomy from common funding sources in the art industry (e.g. sales to collectors, or project-specific funding from a company or governmental body). In turn, this creates opportunities for the art stack to invest in itself, and to build and control its own versions of other features currently provided by the art industry, such as places to show work.[78]

Artist-led companies such as teamLab present one vision of the art stack strategy, combining

integrated studios, *DIY approaches* and well-equipped *collective spaces* with *dedicated display spaces* and funding through *ticketed experiences*.[79] At the time of writing, teamLab has over 650 personnel ranging across art, architecture, animation, coding, marketing, robotics and other disciplines. It has also built its own site in Tokyo—teamLab Borderless, operated in collaboration with the Mori Building—to host its large-scale immersive digital works. Borderless opened in 2018
and attracted 2.3 million visitors in its first year, making it the most popular single-artist museum in the world as measured by footfall.[80]

This demonstrates the potential of art stacks to expand to a larger scale than many well-known current museums—an observation that has precedent in the power-law distributions that have emerged in other media across the cultural sector, accompanying a shift from a craft-based model to an industrialised one: Hollywood movie studios, major record labels,

the Italian development of the fashion house system, videogames and social media.

Where reliant on *ticketed experiences*, the art stack operates in proximity to the financial models of circuses and theme parks: mass-market models organised around ticketed access. For some actors in the art world, this may raise the question of whether they are indeed 'art spaces' or just a variation on existing entertainment typologies. More generally, a direct-to-consumer, mass-market model organised around ticketed events (or in future, perhaps product design, digital services, etc.) may raise the question of *minimal viable art* for those who remain attached to older models of the cultural institution and art industry more generally —i.e. What is required for these initiatives to be understood as 'art' at all?[81]

Seen from a different point of view, 'minimum viable art' challenges preconceptions around the anticipated scale (of team-size, turnover, physical dimensions, etc.) of existing art practices; and it may be that it

invites connection to quite other art histories which are not always obvious to the current generation of Western critics (or other audiences).[82] This demonstrates the possibility of a successful art-industrial phenomenon that publicises an alternative conceptual engagement with what art is and could be—one that diversifies away from the existing narratives of the mainstream contemporary art world.

The art stack holds the promise of a much richer engagement between artists and technology, within dedicated environments (physical, technical, presentational and commercial). Art stacks may be modelled around quite a different financial core, such as *building tools* or selling *art products*, and may explore other routes to the public, such as deep use of online spaces.[83] But they also offer a model of artistic practice that is substantially different from what is widely valorised in the art world at present.

'Minimum viable art' aside, two factors in particular stand out. The first is that the operational model of 'the artist' becomes something almost entirely team-based. This

diverges from the ‘individual artist’ model preferred by the existing art world (and often presumed by the art industry), to a much greater extent than ‘a collective’ or the kinds of approaches favoured by *integrated studios*. Although it is possible that a relatively flat hierarchy might be adopted inside some art stacks, the contrast in expectations from current art training and professional life are nonetheless very substantial, placing an emphasis on skills for negotiating complex, ongoing work relationships within common projects where personal or small-group authorship is diminished.

The second factor is the uneasy relationship between many extant artistic practices, including those involving advanced technologies, and the kinds of commercialisation necessary to fund an art stack. The possibility of generating art stacks has been refused many times in the past, including by pioneering AxAT artists.[84] Art stacks require a very particular negotiation of the relationship between commerce and art, and this may filter both the practitioners and the practices that are able and willing to generate them.

Strategic Significance

For AxAT artists:

a new, art-led structure for those whose work fits with it, capable of operating at a new level of artistic ambition; lowered reliance on contemporary models of artistic funding (i.e. existing channels of private and public investment).

For the tech industry:

potentially new high-level collaborative or competitive relationships; a sophisticated content pool that can be ported to emerging platforms.

For cultural institutions:

source of technically sophisticated work; a potential collaborator but also competitor.

For private sector investment:

lower influence of collectors and auctions; potentially profitable early-stage investment, art stack IPOs; potential real estate development and public-private partnership access points

for urban regeneration projects through supporting tech sector/cultural sector interactions.

For public sector investment:

city- or nation-level branding/soft power; potential for standout tourist destinations, state role supporting early stage innovation.

Open questions

- Over the mid-term, how far will art stacks be distinguishable from organisations in entertainment or product design?
- Over the long-term, to what extent can the art stack model be expected to disrupt and undermine traditional models of singular authorship, both from a symbolic perspective and the operational reality of offering a more attractive context for specialists to contribute their skills?
- What would an art stack for services look like?
- What will be the impact of the art stack model on arts education?

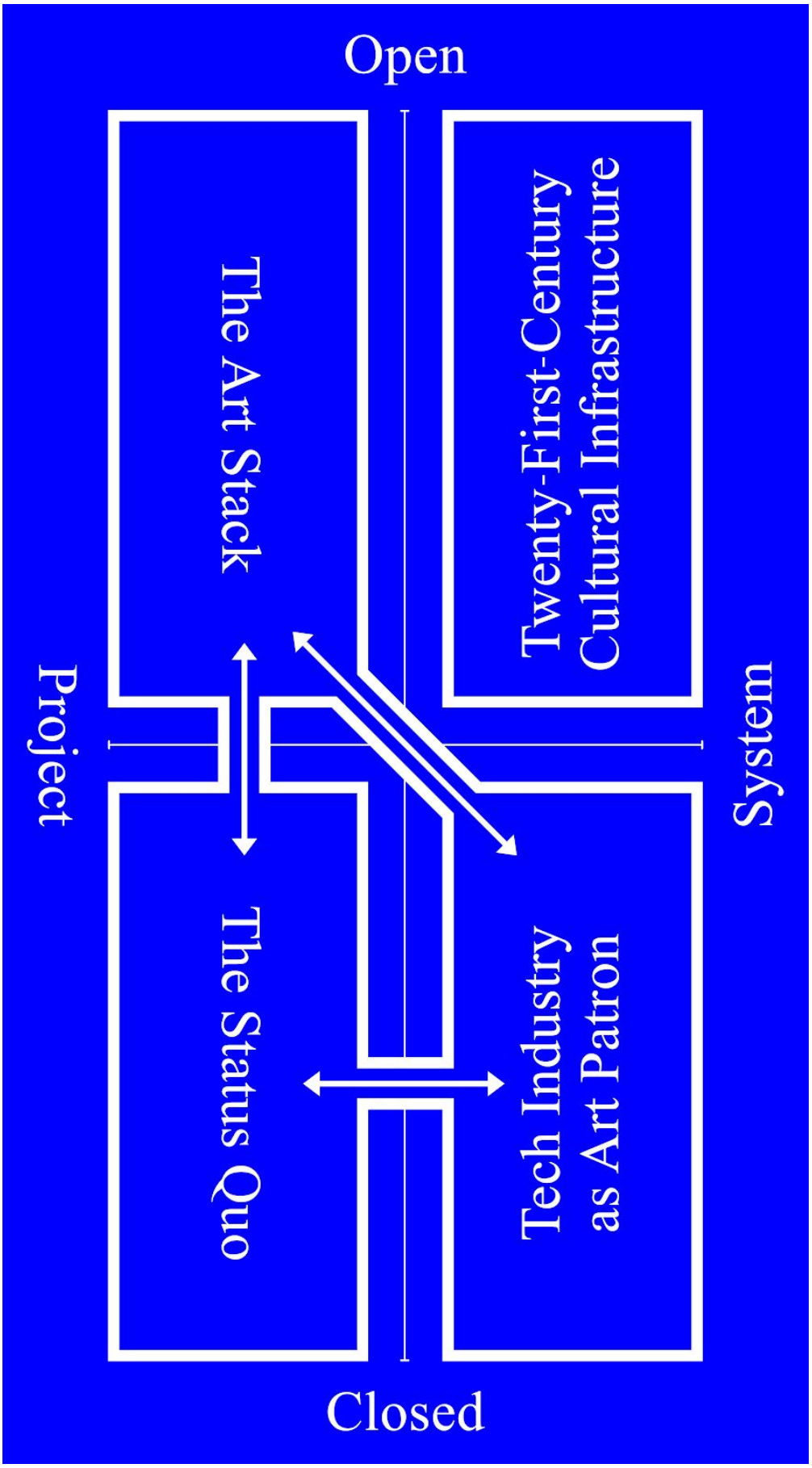

Figure 3. General focus of infrastructural investment and relation of art-industrial strategies.

Strategies

Twenty-First Century

Cultural Infrastructure

Art as a strategic
societal asset

We need new institutions to deal with
the new problems that are emerging.
Holly Herndon

The strategies of the *tech industry as art patron* and the *art stack* represent major disruptive vectors in the existing art industry. They represent new movements poised to redistribute the balance of power in the contemporary art world landscape.

They clearly demonstrate the potential for certain strands of AxAT to scale up their operations substantially. But the particular modes of scaling they offer are ultimately constrained by the financial, operational and strategic demands of very particular kinds of large-scale private-sector organisations, be they tech firms operating as patrons or sponsors, or *art stacks* themselves.

In contrast, the third strategy described here involves the conscious development of a *twenty-first century cultural infra-structure*. This strategy entails the construction of systems designed to support the AxAT ecosystem as a whole, and which are aligned with and responsive to a broad societal agenda.

A lot of questions that aren't being
asked by artificial intelligence scientists
and investors are being asked, and have
been asked for quite a long time, by
some kinds of artist…
In a very hard, pragmatic way,
this art is becoming relevant to the
moment we are about to live through.
Jonathan Ledgard [85]

As described in the introduction to this document, AxAT can be understood as a form of technological innovation that is conditioned by a very different approach to technology —how it is developed, deployed, used and valued. AxAT practitioners frequently work with technologies that may have major societal benefits, but as yet do not synchronise well with existing funding regimes.

- Working with very early stage technologies with no clear pathway to immediate application, or those that have potential for application but do not readily fit with either consumer-focused retail or existing major infrastructural plans, and therefore are yet to find a pathway out of the laboratory.[86, 87]
- Operating to actively critique existing means of technological development, e.g. artist Trevor Paglen and AI engineer Kate Crawford's ImageNet Roulette, which identified racist patterns in the AI encoding of the ImageNet public image database, leading to the withdrawal of over 600,000 images.[88]

- Using technology to provide alternative approaches to non-technological domains, extending AxAT's principle of *success in adjacent fields* into a tangible, quantifiable impact on systems of collective decision-making such as government and law. An example is Forensic Architecture's *Grenfell Tower Fire* project, which draws data from smartphone footage taken by members of the public of the devastating fire at the London apartment block in 2017, in order to reconstruct the order of events—an operation that enters into the legally charged context of determining accountability for the disaster.[89]

The twenty-first century cultural infrastructure strategy is responsive to the value provided by such projects, while acknowledging that their widespread development requires an approach not easily reconciled with the strategies detailed previously. The *art industry* capabilities necessary to effect this strategy vary widely, and it is unlikely that a single actor at less than national government scale could

adopt them all. This strategy is therefore best represented through a federation of efforts to bring infrastructural plays into alignment, at different levels and scales.[90] The central components of the strategy include:

Alternative routes to access tech.

The development of systems that lower the barrier to access of advanced technology, in ways less dependent on patronage or the ongoing negotiation of sponsorship, and enabling a maximally diverse set of practitioners and perspectives to engage with technologies at all stages of development. These can be envisioned as third-party systems that enable AxAT practitioners working in specific subfields (e.g. VR, synthetic biology) to develop and display work in environments, such as existing galleries or museums, that cannot on their own contribute sufficient capital investment to develop in-house skills, equipment and capabilities to host this work.[91]

Legal arrangements.

Building on the tradition of experiments with artist's contracts, the development of new ways to enable engagement between partners on AxAT projects.[92] On one level, this means finding alternatives to the common three-month residency arrangement which are better suited to the cost, time frame and collective nature of serious AxAT projects. On another, it means broaching imminent legal questions spurred by AxAT technologies themselves, such as the legally complex debate about whether the person who provides data used to train a machine learning system has a claim to its products.[93] Additionally, existing means of representation for artists, an essential art-industrial function of galleries, may be inadequate to the demands of AxAT practice, and may both require and reward serious innovation.[94]

Learning and insight.

The generation of new knowledge by AxAT practices is an asset in its own

right, and not purely in terms of intellectual property. A logical development of AxAT skill-sharing (a semi-official feature of *multidisciplinary courses* and *collective spaces*) is the development of new kinds of venues in which to share what has been learned.[95] This also extends to the strategic deployment of AxAT practices as sources of collective insight into unfolding conditions, and accordingly suggests a place for government departments, legal bodies and other 'non-technological' agencies in the commissioning and development of such work.[96]

Distribution systems.

Current experiments from within AxAT such as *building tools*, *art products and byproducts as assets* have, to date, largely conformed to models widely adopted within the tech industry—for example, retail of designed products to individual consumers, or seeking venture capital investment. On the other hand, while there has been innovation around

designing purchase mechanisms, they have not (or not yet) achieved widespread adoption.[97]

While not per se exclusive of input from either the *tech industry as art patron* or *art stacks*, this strategic approach is more closely aligned with the mission of cultural institutions and the various bodies that support them (such as foundations, funding councils and government departments). It represents an extension of these bodies' mission to maximise the audience of cultural projects on the grounds of their significance to broader society—albeit also constituting a series of breaks with how this role tends to be understood at present.

Cultural institutions should play a role in helping point public attention to the things that we should be paying attention to. And those are usually things which are not in the top headlines, which are not beholden to the advertising industry and not necessarily responding to political talking points. They should play a beacon or spotlight role.

Noah Raford [98]

The most obvious infrastructural plays available to existing cultural institutions such as museums and galleries are those that enable them to retrofit AxAT into current systems. For example, a new or existing museum might build *dedicated display spaces* to host AxAT work. This is a major capital investment, with particular risks.[99] But while valuable in its own right, this only treats one aspect of the AxAT ecosystem, and deeper shifts in operations would be necessary to engage fully in the project of building twenty-first century cultural infrastructure. Likewise, this strategy would be expected to align with national- or international-level governmental policies around the support of both the arts and innovation, but bring them together in historically new ways.[100]

Strategic Significance

For AxAT artists:

greater autonomy with respect to tech industry; lower barriers to access to advanced technologies; other ways to scale impact of projects, outside of traditional art, tech or entertainment industry channels.

For the tech industry:

opportunities for small-scale and/or emerging-technology developers.

For cultural institutions:

a pathway to alternative operational models.

For private sector investment:

opportunities to be involved in emerging technologies not married to conventional startup pathways.

For public sector investment:

production of insight and intellectual property as strategic assets at societal

level; alternative system to develop genuinely innovative ideas.

Open questions

- What would a major public art institution look like without physical exhibition or performance spaces?
- What type of metrics would be needed to evaluate the impact of work that exists within art and also outside art?
- How can cultural institutions support the development of technologies that do not satisfy the contemporary funding conditions of the tech industry?
- How can AxAT be a part of national or international industrial strategy, and what would be the impact of this on the cultural sector?
- At what point does this strategy constitute the incorporation of an ‘alternative tech industry’?
- Is it possible that such a large-scale initiative could separate from the art world as currently understood and becomes autonomous, with its own funding mechanisms, institutions and discourse—a hard fork in the art world?

Notes 64-100

64. There are historical examples of artists placing themselves in social and commercial partnerships, for example John Latham's *Artist Placement Group*.
Link: bit.ly/2Tfu6mh

65. Holly Herndon is a Berlin-based American composer, known for sophisticated integration of digital systems and especially artificial intelligence with the human voice and live performers.

66. Paris Innovation Review argues that placing artists within cutting-edge research programmes helps with *decompartmentalisation*, helping researchers to innovate and learn from other fields.
Link: bit.ly/2NiTBzt

67. Natalie Jeremijenko's *Live Wire* installation, designed at Xerox PARC, is an early example of physical interfaces to networks being deployed as a *ubiquitous computing* experiment.
Link: bit.ly/2FH0oyU

68. Simone Bhan Ahuja recently argued in *Harvard Business Review* that 90% of innovation labs fail because placing research in a *laboratory setting* isolates it from meaningfully engaging with the goals of organisation.
Link: bit.ly/2FDblBv
That said, the approach has produced some significant successes over the years, most famously at Xerox PARC.
Link: bit.ly/30aBWPA

69. Corporations frequently engage with the arts as part of their corporate social responsibility work, i.e., business commitments to reinvest a fraction of profits into projects of social benefit.

70. The prevailing art world discourse may position art as critically reflective on the broader culture; but it may be this asserted criticality itself that makes art an attractive vehicle to corporations keen to present themselves as culturally sophisticated.
Link: bit.ly/2TiRgs3

71. Primer is an arts platform based in the headquarters of Danish biotech company Aquaporin, which describes itself as being *'intended as a platform for production, development and support for artists and the field of art in general, exploring its introduction into new spaces and professions.'*
Link: bit.ly/2RcpGdi

72. Apple have recently launched several augmented reality programmes, developed with artists and educators in collaboration with the New Museum. These include in-store events under the rubric of Apple AR[t] Labs and related AR[t] Walks through public urban spaces.
Link: apple.co/2tU1nJ3

73. A userful warning about the limited attention span of corporations investing in art programmes is the closure of the Interactive Design Institute Ivrea in 2005, after only four years of operation.
Link: bit.ly/30cBVur

74. As a thought experiment, it is entirely possible given the possibility of nation-state and supra-national legal moves against social media networks (e.g. anti-monopoly legislation, media regulation)—plus scandals such as Cambridge Analytica's involvement with Facebook—that the support of artists by such companies could trigger a backlash and become branded as *'trustwashing'*.

75. As Mike Pepi summarises
'Christie's thrives on scarcity. Google does not.'
Link: bit.ly/2TeR8d7

76. For example, see Lucy Sollitt's 2019 report for Creative United on The Future of the Art Market, which highlights some of the urgent challenges faced across the arts in adapting to new forms of techno-economic infrastructure.
Link: bit.ly/3b5QPXw
Note further that, while hard data is difficult to acquire, there are many accounts of tech industry figures being favourably disposed toward art and artists but being extremely skeptical of the art industry's systems of valuation.
Link: bloom.bg/2yyK9DZ

77. *'If you were working with a developer and coming up with idiosyncratic approaches towards a specific machine learning architecture, then another artist comes into that residency and the developer takes some of those ideas and applies that to the next person—that's something that can be really problematic in an arts context. Likewise, if you have the same developers working with a large pool of artists and you have one specific approach towards technology that is then funnelled into different practices rather than having dramatically different approaches'.*
Holly Herndon

78. It should be noted that large-scale studios are not themselves unheard of in the history of art. For example, Rubens was famous for his huge workshop filled with students and apprentices, whilst at one point Damien Hirst employed 250 people, worked with high budgets and opened a museum. Such ventures, however, typically have been lacking some of the features of AxAT practice itemised in Chapter 1, and represent a continuation of conventional art industry models under new ownership, as it were, rather than a break with the status quo as indicated by the kinds of infrastructural plays documented in Chapter 2.
Link: bit.ly/2FFDM1J

79. teamLab run their own 10,000-square-metre digital art museum in Tokyo.
Link: bit.ly/37PI6HE

80. Tickets to teamLab's *Borderless* cost approximately $30 in 2018, when they attracted 2.3 million visitors.

81. An alternative conceptualisation might be that art stacks exceed *maximum viable art*, given that they operate beyond the financial and organisational models that have predominated in the art world to date.

82. teamLab locate reference points for its expansive immersive environments in premodern Japanese art, specifically what it calls *ultrasubjective space*, which offers an alternative conception of the optical relation of viewer to artwork, based in premodern Japanese pictorial traditions rather than Western linear perspective. The viewer imagines themselves as a component of a depicted scene, rather than observing it from the periphery.
Link: bit.ly/2Tqedd9

83. As in the case of pop artist KAWS, the output of whose work spans limited edition vinyl toys available to the mass market, large-scale sculptures positioned within the contemporary art milieu, and collaborations with fashion brands such as Supreme and Nike.

84. Pioneering biotech artist Oron Catts worked with early stage tissue culture technologies. Despite the evident art stack potential—via an art product or building tools modelling his early work developing *victimless meat* and *victimless leather*—Catts sees the commercial development of these ideas as symptoms of consumerism and antithetical to the deeper concerns of his practice.
Link: bit.ly/37Y7eMg

85. Jonathan Ledgard collaborates with artists on technology and nature, is a novelist, expert on AI and robots particularly in Africa, foreign and war correspondent for The Economist.

86. Protocells are an example of an early-stage technology with no clear pathway to immediate application.
Link: bit.ly/2slv05W

87. Neighbourhood-level electricity generation is an example of a potentially significant technology that does not readily fit with either consumer focused retail, nor existing major infrastructural plans.

88. Trevor Paglen and Kate Crawford:
'We created ImageNet Roulette as a provocation: it acts as a window into some of the racist, misogynist, cruel and simply absurd categorisations embedded within ImageNet. It lets the training 'speak for itself', and in doing so highlights why classifying people in this way is unscientific at best, and deeply harmful at worst.'
Link: bit.ly/37V4Fuu

89. At the time of writing, Forensic Architecture are crowdsourcing video footage of the Grenfell Tower fire in order to projection map an accurate 3D video of how the fire progressed through the building.
Link: bit.ly/2taLhL9

90. *Federation* is used here to mean something similar to *interdependence*, as advocated by Holly Herndon and Mat Dryhurst as a principle for an alternative to the *independent music scene*, focused on complex ecosystems of new organisations and financial models, and evolving relationships to audiences and tools.
Link: bit.ly/2t8Nqak

91. One mechanism for opening up routes of access to technology would be the provision of platforms to enable consortia to be built around AxAT-related capital investment from cultural institutions, much as is the case on major academic science and engineering projects like CERN.

92. W.A.G.E. is an activist organisation working to establish sustainable economic relationships between artists and the institutions that control the art world.
Link: bit.ly/2RbUMSB

93. Property rights over personal data has evolved into a heated debate, and the knock-on debate over who owns the intellectual property of technologies created from that data is likely to become even more contentious as those products become more valuable.
Link: bit.ly/2FDhEFb

94. One could make a comparison to the growth of *label services* in the music industry. Traditional record labels provide artists with a portfolio of services (management of publishing rights, making arrangements with stream services, pressing records, tour organisation) in return for a contract that is usually exclusive and long-term. Label services disaggregate these functions into individual services that artists can opt into and out of, as and when needed.
Link: bit.ly/2tTN3AE

95. As part of a recent retrospective at London's Institute for Contemporary Art, Forensic Architecture ran a series of skill-sharing short courses in forensic architecture, offering the public training in techniques they had developed.
Link: bit.ly/30h6Oya

96. Relatively small-scale initiatives like the UK government's Policy Lab currently take a version of this approach, although largely without engagement of the kinds of technology with which AxAT practitioners are working.
Link: bit.ly/2TfWfKg
The most serious investment in this strategy to date is arguably the Dubai Future Foundation and the related Museum of the Future.
Link: bit.ly/2NjSAXM

97. Attempts at building AxAT distribution systems have tended toward a degree of conformity with legacy art industry practices, such as aligning with a model of value as being produced by scarcity.

98. Noah Raford is Futurist in Chief and Chief of Global Affairs at the Dubai Future Foundation.

99. The high cost of systems needed to display AxAT works, which include both technology and the expertise to deploy and maintain it, is itself prohibitive, and represents a major investment in a new capability for existing gallery or museum models. ROI for existing galleries or museums is further complicated by the tendency to rotate exhibitions—a dedicated display space not in continuous use offers a relatively poor return.

100. Government investment supporting arts and innovation might be understood as a reanimation of the frequently unrecognised role played by governments in the original development of many contemporary technologies during the twentieth century.
Link: bit.ly/2RaqJdM

Ben Vickers and Hans Ulrich Obrist in Conversation

12th January 2020

Pluto-Saturn Conjunction

Ben Vickers

It's almost seven years ago today that we met for the first time, through the very fortuitous introduction from my late mentor and great mathematician, John Nash. At that time, I was involved in developing complex networks, and I think it was the P2P Art Collection that initially brought us into dialogue about how emerging complexity theory, networks and technology could have a transformative effect on the art world. It was you who posed the question, 'What could the art institution of the twenty-first century be?', which led us to begin working together—and it seems that today, what we had discussed then as only a set of possibilities that must be responded to is entering a state of maturity across the art world.

This realisation, and the fact that so much of what previously appeared certain is now in a state of flux, has been the rationale for pausing, so to comprehend what might come next, and to share those insights more broadly in this strategic briefing with the art world. And so it feels salient to reflect together on the

worlds, thinkers, threads, objects and carriers that brought us here. For you, what was the moment—or the occasion—when it became evident that engagement with technology is critical to art?

Hans Ulrich Obrist

I think there were a few crucial moments. One of them was with Philippe Parreno. I met Philippe in the 1990s, and together we did his first major institutional retrospective in 2002, in Paris. At that time, we were both obsessed with the work of Jaron Lanier, who is very much at the origin of virtual reality, so we worked with Jaron Lanier on an exhibition for the Musee d'Art Moderne. In his first ever retrospective, called *Alien Season*, Philippe had an exhibition which could be reinterpreted in many different ways: lights would fade in and out, images would appear and disappear. It was very much the exhibition as a programme, the exhibition being alive. Lanier came to Paris and worked with Philippe and me, and he suggested that a

giant cuttlefish should actually be the trigger for all of these events. The cuttlefish is an extraordinary animal, which has a language of animation to communicate with each other; the cuttlefish projects what it thinks onto its skin, so its skin is like a screen of its thoughts. This hugely intelligent being became more than a guide; it became really the trigger of this programme, which was the beginning of Philippe making these exhibitions alive. I thought this was interesting and particularly relevant to the current discussions about virtual reality and artificial intelligence but also these technologies' still open relationships to ecology and the environment. Philippe also referred to Rauschenberg in *Alien Season*, which is not a coincidence, because Rauschenberg was one of the protagonists of Billy Klüver's 'Experiments in Art and Technology'—another crucial figure and reference point for me. So, in his show, Philippe projected onto seven panels of Rauschenberg, a film lasting four minutes

and thirty-three seconds, which was of course also an homage to Cage's *4'33*.

Circling back to Billy Klüver—he was an acquaintance of mine; I went to see him regularly and did long interviews with him. 'Experiments in Art and Technology' from the 1960s was a fascinating project where he wanted to bring artists together with engineers, and create collaborations. What drove his project was not only the question of how new technology and science could be impacting art, and vice versa, but how a new type of relationship between art, science and technology could be opening up something entirely new and generative for society.

[B V] *That's certainly a concern that we all share. In the last seven years, we have worked with art and technology as an emergent discrete field, which has offered a novel way of operating and allowed us to see beyond 'art and technology' as a historical relationship between two entirely distinct models of*

practice and cosmological perspectives. The interstitial mode—where we lose the disjunctive logic—is opening up a space that was not easily imagined previously, to the extent that our current understanding of what art could be and our general perception of consensus reality is challenged on a daily basis. In respect to this clouding and complication of vision, what role is simulation playing in this disruption of perspective? Do you ever get the feeling that we are living in a simulation?

HUO There is definitely a new art form emerging from visual media. Moving image has often been trapped in this idea of a loop; whenever you show a film or video installation there are moments where it repeats. This has been disrupted by the emergence of simulations. Two experiences standout here: Jakob Kudsk Steensen's *Catharsis* and Ian Cheng's *BOB* or *Emissaries* trilogy, all of which share the potential of never being the same twice. They are not moving images that have a loop, like where the video

reboots or restarts, but they are cybernetic open systems at their core: digital living organisms more similar to a tree than to a film. I think that produces a completely new art form.

However, there is also a more historical connection between technology, science and art as noted by the late Heinz von Foerster, one of the architects of Cybernetics, who worked with Wiener from the mid-1940s, and, in the 1960s, founded the field of 2nd Order Cybernetics, in which the observer is understood as part of the system itself and not as an external position. I had known Foerster well in the 1990s, and in one of our many conversations, he often expressed his views on the relationship between art and science: 'I've always perceived art and science as complementary fields', he said. 'One shouldn't forget that a scientist is in some respect also an artist. He invents a new technique and he describes it. He uses language like a poet, or the author of a

detective novel, and describes his findings. In my view, a scientist must work in an artistic way if he wants to communicate his research. He obviously wants to communicate and talk to others. A scientist invents new objects, and the question is how to describe them. In all of these aspects, science is not very different from art'.

[BV] *In this respect, we could say that engineers and scientists are among some of the most impactful artists given the capacity and scale for world-building as exhibited by the infrastructure and invention they bring to society. In fact, as Benjamin Bratton argues in The Stack: On Software and Sovereignty, technological infrastructure and invention are transforming geopolitics into stack-politics, thus requiring that sovereignty is considered outside of its relationship to territory, and platform governance outside of the narrow lens of corporate interest. The question then arises as to how the role of culture and the role of art more generally, are shifting in the face of the seismic shifts wrought by the*

engineering of large scale technology stacks, such as Google, Amazon, Apple, Tencent, Alibaba, etc?

HUO In the 1960s, Marshall McLuhan noted the ability of art to 'anticipate the future'. In the foreword to his book Understanding Media he calls art 'an early alarm system', which is pointing us to new developments in times ahead and allowing us 'to prepare to cope with them'. He says: 'Art as a radar environment takes on the function of indispensable perceptual training'. In 1964, when his book was first published, the artist Nam June Paik was just building his robot 'K-456' to experiment with the technologies that subsequently would start to influence society. He had worked with television earlier in an attempt to disrupt the straightforward mode of consumption by a growing global audience, and later made art with global live satellite broadcasts to use the new media less for entertainment but to point us to their poetic and intercultural

capacities. Their works and thoughts again are an ‘early alarm system’ for the developments ahead of us. A collaborator of Paik was the artist Rebecca Allen, who also was far ahead in her creation of the *Aspen Movie Map* in 1978 which laid the ground for Google Street Map decades later, as well as developing complex simulations of living ecosystems long before other artists approached this area, and developed an early precursor to Google glass, *MyoPhone*, which directly influenced Google’s creation. The Allens and Paiks of our time are of course now working with aerospace, artificial intelligence and synthetic biology.

Another kind of visionary from the 1960s was Jack Burnham who understood something profound about the relationship between cultural shifts and changes in computational infrastructure, and although he wasn’t heard as widely as he should have been by his contemporaries, his insights still carry a lot of traction and power for our day and

age. Burnham articulated the birth of systems aesthetics as an indispensable part of the new cybernetic culture, where change no longer emanates from things but how things are done, thereby positioning protocol-building as art that has the power to influence society at large.

On this note of ‘how things are done’, it may be worth mentioning the work that is currently being done by Tobias Rees at the Berggruen Institute. Rees is leading the Transformations of the Human programme, which places teams of artists and philosophers into technological and scientific settings. That leads us to the APG, the Artists Placement Group from Barbara Steveni and John Latham—who I should have mentioned at the very start. If we want to understand complex transformations and their effects on the world, we need artists in the mix, and that means we don’t only need artists in galleries, museums, art fairs and biennales but, as Latham and Steveni say,

we need artists out there in the world. That is why every company, every corporation and every ministry should have an artist on the board of their organisation or as contributors at early development stages of new technologies. And similarly, if you think about the Artist Placement Group's idea of art going outside the museums and migrating into society, it's a great possibility that exhibitions can migrate into non-art contexts: educational curricula, closed R&D labs, governmental departments.

I am therefore really excited that, at the Serpentine, we are experimenting with the age-old lab format as part of the R&D Platform that you are spearheading to further support daring artistic engagements with advanced technologies. In some ways, I am reminded of the *Laboratorium* project that I curated with Bruno Latour and Barbara Vanderlinden in 1999 in Antwerp. It was a unique exhibition paradigm that engaged with the early Renaissance 'school of

production’ studio model used by very well-known artists such as Rubens and van Dyck, and connected that history with the possibility of using the exhibition space as a node in a larger network of activity spread across the city and involving artists, scientists and the general public.

Speaking of much more direct forms of art’s impact on the world, it's interesting because at the moment, Edi Rama is Prime Minister of Albania. So Albania continues to be an artist-run country, but we've always had artists who have run for office. At the same time, we have lots of Latin American writers—from Octavio Paz to Carlos Fuentes—who entered diplomacy and were either ambassadors or cultural secretaries. Eileen Myles, the poet, ran a presidential campaign. She ran with her dog for office in the US. And more recently, Tania Bruguera announced that she's going to run against Raul Castro in Cuba.

But the Artist Placement Group is not only about that kind of direct intervention. The Artist Placement Group is much more than having artists enter political office. It's really about how art can co-produce reality at different scales. And it's fascinating, I mean, if you look at projects like *Niddrie Woman* or *Five Sisters* today, these appear to be Land Art projects, which happened in Scotland, and they came out of this idea of Latham and Steveni of the placement. Latham and Steveni placed Latham himself into a Scottish government office where he would show up regularly for meetings. At that time, the idea was to remove these coal heaps at great cost, and Latham said it was a monument/anti-monument in terms of the coal age, making clear that this polluting energy of coal was the past and that we needed to find new energy. It was an ecological statement to actually keep these coal heaps, to stay as a sign of a bygone age. And he convinced the government to save this money, to use it for a social purpose rather than spend

millions to take these piles of coal away, and they became Land Art monuments in their own right. By actually placing himself in Scottish office, Latham co-produced a reality that was consequential at different levels.

[BV] This was very much a catalyst and inspiration for us in rethinking the future of the arts institution on the advent of our fiftieth anniversary, in forming a rationale for new modes which could contribute to a reorientation of the art field and its core operations towards the creation of active forms, to reference Keller Easterling, and thus, active work. We are also introducing what we call 'Slow Programming'—long durational projects which expand beyond the conventional limits of a museum or a finite exhibition—works will be in the galleries, outside in the park, offsite in London and internationally, online and within the web of ideas and relationships spun from encounters among collaborators, projects and the public

of the Back to Earth exhibition that will open this summer.

This shift towards a proactive durational form of cultural production dovetails very much with a more expanded understanding of technology—as 'the active human interface with the material world', to quote Ursula K. Le Guin. Such interfaces require adequate time and space for construction, both in narrative and technically, an idealistic but important trajectory to explore at the heart of the art and technology experiments. What are your thoughts and feelings on this?

HUO You and I have discussed in many of our recent text collaborations for Wired, Spike and other publications that the key theme underlying many new experiments in art and technology is the relationship between technology and spirituality. How can we go beyond the body/mind division? How can we work on spirituality, neuroscience and technology simultaneously?

We had conversations with Yuk Hui, Hito Steyerl, Shuddhabrata Sengupta from Raqs Media Collective, Kenric McDowell and Wolf Singer addressing the question of how Euro-centric modernity is still marked by various regimes of separation that have produced binary categories and questionable monocultures in large scale tech infrastructure, which find their root in epistemologies borne from unexamined assumptions made in the construction of the enlightenment project. As Yuk Hui has said, it is vital that we consider alternative cosmotechnics and work towards a plurality in the first principles that drive the construction of technology today. Nature and culture, body and spirit, secular and spiritual; these dualisms have remained dominant and are inscribed firmly in the institutions of our time but many artists, thinkers and discoveries are challenging these assumptions today, and it has become a common thread that ‘technology’ serves as a discursive gathering point for this

new enquiry, and the fresh attitude that offers so much hope today.

So, as we think about the ‘new’ Serpentine, we need to think about how an institution can go beyond these dualisms, how we can become a place that welcomes this new enquiry. Of course, any new institution for the arts that aims to cut across these dualisms and invent new formats that cultivate a more integrated idea of culture has to be tested on a smaller scale, before it has something to offer on a larger scale. In this sense, Edouard Glissant shares an inspiring vision for artists and art institutions to work in our extremely complex and difficult age. Glissant understood early on that we live in an age of globalisation, and he understood that the homogenising forces of globalisation are also at stake in the art world. A lot of people understand that homogenising globalisation needs to be resisted, but what makes Glissant unique is that he understood already in the 1960s that the

counter-reaction to globalisation would lead to a new form of localism, to a new form of nationalism, to a new form of racism—which we can see now in many parts of the world. Glissant said that's why we need to resist both. He instead teaches us, coming from an island, that we should think like an archipelago rather than a continent. Continental logic is homogenising, and archipelago logic is much more generous and open; it is symbiotic.

[B V] I think it's interesting that this briefing—which is really a piece of collective intelligence as it is sewn from many insights delivered by collaborators, colleagues, peers and friends—signals neither a utopian nor a dystopian future, unlike most narratives about art and technology. Instead, what we see is that the ossification of certain normative aspects of the traditional art institutional approach and critically—infrastructure—is freeing up space for a more diverse and, as you like to say, living field with a multiplicity of approaches and infrastructural turns. In

fact, there is a sense in which the more varied the strategic and plural the approach, the more interesting and multilayered this world will become. This allows us to chart a pathway for the Serpentine that can explicitly build on what we have been able to construct thus far—the creation of tailor-made production and narrative structures that render speculative artistic projects with advanced technologies a reality, thereby providing a space for the first prototype of something that may go on to have multiple unexpected lives and reality versions. When we first initiated this work, did you anticipate that we would find ourselves here today?

HUO Well, I certainly did not foresee HUO9000—a neural network trained on my archive of interviews and curatorial projects. But I am excited that it's not only you who thinks it's a good idea but also the Department of Digital Humanities at King's College, with whom we are collaborating on the Creative AI Lab. The questions that HUO9000 as an entity raises are very

compelling, both existentially but also in terms of how one can see the shifting landscape of the art world beginning to transmute in the years ahead. You and the team have said that you have ‘grand ambitions for the potential of democratising and automating curatorial knowledge, as well as questioning how we handle IP, governance and authorship in an age of automation’; it feels that this type of experimentation, and the playfulness with which it is approached are urgent in this moment. It reminds me very much of AnnLee, the fictional character initially devised by Pierre Huyghe and Philippe Parreno who ultimately became a sign, offered up to different artists to read and interpret successively and separately, each following his or her own inclinations. Gradually the world of AnnLee began to take shape and the numerous questions raised by its authors slowly linked together—questions on the status of the image, of representation, of beings in the world of the character and on the very

polyphony of the work. Perhaps above all, the question for these artists became, ‘How can a community constitute itself on the basis of the same sign, identifiable to all, yet peculiar to each person?’

It seems to me that what you are building with the R&D Platform is not too dissimilar from AnnLee, but with greater reference to sci-fi. I am very intrigued to see how this process could lead to a place after, or beyond, art and technology, something that could in its maturity even resemble the Glass Bead Game. Perhaps, to a place where it is finally confirmed that, ‘in reality, plants are actually farming us, by giving us oxygen daily, until we all eventually decompose, so that they can consume us’.

I really love that meme.

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