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There is no Such Thing as Blockchain Art

A report on the current status of the intersection of Blockchain and art

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Introduction - Discussion, Actions and Approach

This paper is the conclusion of a series of actions and discussions taking place within the Ethereum community, with the intention to find a potential connection to the art community.

Before the discussions and subsequent formalization in this paper, the authors reached several assumptions based on their research:

- Blockchain art is a term often tied to digital art marketplaces that operate in cryptocurrencies and issue ERC721 tokens in lieu of certificates of ownership, as the nature of this token standard allows for digital ownership, scarcity and is non-fungible.
- The blockchain ecosystem tends to be more flexible in terms of what is classified as art as opposed to the art market, hence clashes with the art market when presenting art from the community.
- The art market has been exploring and trying to adopt blockchain technologies, mostly centered around the technology being able to facilitate title registries in public provenance databases, and generating new marketplaces. However in terms of the implementation of the technologies in art pieces, the wide majority has failed to achieve technical and conceptual consistency.
- Blockchain technologies, as the internet, are versatile to create new multi-media artworks. These can be either inspired by the ethos and concepts of such technologies or need the technology to exist.
- The art market lacks education about blockchain technologies. However, it capitalizes on what is being called “blockchain art” without understanding the risks and limitations the technology has.
- The blockchain industry and the different protocols, standards and applications are at the very early stages of software development (it is mostly beta software) and it is essential to understand the possibilities it brings to artists such as licensing, tracking provenance, using blockchain as a medium to produce art, or simply using a transparent marketplace
- Blockchain technologies have been over-sensationalized due to their versatility and potential, however when put into practice, sometimes the use of such technologies is unnecessary
- There is a general lack of understanding from inside the blockchain ecosystem of the art market. The assumption from the tech industry is that they need to help the art market solve their problems by inventing new technological solutions.
- Many “problem solving” solutions mentioned in the aforementioned assumptions create new problems for the art market, mainly due to the lack of ongoing conversations, discussions and knowledge sharing between both spheres.

While there have been several reports and ongoing discussions on the topic, they primarily explore potential art market developments, and less of the creative possibilities and developments that Blockchain can offer and inspire. By taking an art theoretical approach, looking at works such as Walter Benjamin's *Works of Art in the Age of Mechanical Reproduction*, Marshall Mc Luhan's *The Medium is the Message* and *Artists Re:thinking the Blockchain* written by Ruth Catlow, Marc Garrett, Nathan Jones, and Sam Skinner, this report seeks to question the ongoing advances and projects, explore where this intersection might have genuine benefits for both, and where it might not.

Initial Article

After the initial research phase, the authors published a short article denominated "Will it change in 2019? on Art and Blockchain"[1] on January 23rd, 2019, addressing the concerns from the art world's perspective. The main author, Stina Gustafsson, is an art marketing professional that has been focused on topics such as the democratization of the industry, and nascent technologies. The article was directed towards the Blockchain community and published on the Department of Decentralization blog.

The Department of Decentralization used social media (Twitter) to spark the discussion online, and invited the commenters to join a panel discussion at Görlicon.

Görlicon

Our article was launched alongside an invitation to a live discussion called "There's no such thing as Blockchain Art", that took place on January 31st, 2019, at Görlicon, an Ethereum oriented conference based in Berlin. The discussion gathered more than 60 people from diverse backgrounds, mostly linked to Blockchain. The authors conducted an open discussion with very few guidelines, to allow attendees to express their opinions on various aspects linked to blockchain technologies and art.

The discussion finalized with a lack of consensus on what is Blockchain art, however, conclusions on the need for wider awareness and education to both industries were widespread and agreed upon. The paper authors announced that, in order to be able to gauge sentiment better and gather opinions, a survey would be sent out as a follow-up, where anyone on social media could express the thoughts on the subjects of analysis.

Survey

The authors surveyed 16 people via Google Forms. The short survey was launched on February 5th, 2019. This helped find the paper's direction and valuable contributors, as well as having multiple opinions on the same subjects.[2] Other informal surveys were in the form of interviews or calls for feedback. Some of the statements and ideas the surveyed people shared will be cited along with the pages of this paper.

[1] Full article can be read here: https://medium.com/ethberlin/will-it-all-change-in-2019-on-art-and-blockchain-7d27249a4cce

[2] The full results of the survey can be viewed here: https://docs.google.com/document/d/1y36tTdB09dje2jP9-O-0P7lfi_4q7dsoXx-9EZD1vsY/edit?usp=sharing

Other Actions and Considerations

Later on, the authors, got in conversation with Ruth Catlow[3] co-founder of Furtherfield, that has been exploring digital art, net art, and blockchain art with a series of artists, in order to get a broader perspective:

"I'm much more interested in the work of Rob Myers, Primavera De Filippi, Jonas Lund. There's just a whole body of work that is much more interesting to me. The show at Schinkel Pavillon was really interesting. The Georg Bak exhibition in Zürich was fantastic. The guys working at React in Vienna have been doing deep, really interesting work in the space for a very long time. The work that's going on in live-action roleplay... These are the things that are pretty plurifold to the market. But I just think the market isn't where all the interest is, as far as I'm concerned."

Furtherfield describes itself as:[4]

"the collaborative work of artists, programmers, writers, activists, musicians and thinkers who explore beyond traditional remits; dedicated to the creation, promotion, and criticism of adventurous digital/networked media art work for public viewing, experience and interaction. Developing imaginative strategies in a range of digital and terrestrial media contexts, Furtherfield develops global, contributory projects that facilitate art activity simultaneously on the Internet, the streets and public venues."

The authors of the paper are professionals working in the Blockchain industry or the art industry, with experience on both.

[3] Maria Paula Fernández and Stina Gustafsson, Interview with Ruth Catlow, 'Radical Friendship, Cooperation, And Transnationalism: In Conversation With Ruth Catlow' (2019). https://medium.com/ethberlin/radical-friendship-cooperation-and-transnationalism-in-conversation-with-ruth-catlow-15917c71dfd5

[4] 'About Us - Furtherfield' (*Furtherfield*) [https://www.furtherfield.org/about-us/about-us/] Accessed: 16 May 2019.

There's no Such Thing as Blockchain Art: Case Studies / Rough Consensus - Intro

The authors have been exploring both the old forms of net art, reproduction events, forgery, and many disciplines within the realm of the so-called blockchain art to come up with a "rough consensus" of what this term means. During our journey exploring this topic, we contacted Ruth Catlow, co-founder of Furtherfield. The conversations with Catlow helped us route our "rough consensus" ideas on what is Blockchain Art:

"I think that there's a constellation of approaches to work of this nature, all of which are valid, all of which are really interesting. They take protocols as their medium, as their topic, as code for the sort of metaphors that surround them, for the cultures that surround them.

I think the value of them is that they look for ways to increase the expressive range - by which I mean the work can be made in a way it can be experienced. They also do create new markets, but also new ways for people to perceive and receive.

Oftentimes, the innovation lies in the transmission and reception of the work. And it's all very social, so it changes socially. What was brilliant about the early net art and web art was that it changed the relationship between the artist, the audience, and the artwork. Those are the things that fascinate me in works that are made with and about technology."[5]

This paper aims to explore the various issues and propose solutions in order to generate more avenues of collaboration between the two industries.

In between those problematics, we found the following issue: there is a fundamental problem with the introduction of Blockchain in art. Those artists that have integrated the technology, in one way or another, have positioned themselves as experts. By analyzing the conference calendar on the topics, a pattern arises: only a few artists are invited to talk about this intersection, the same ones, ad nauseam.

Blockchain as a technology is aimed to distribute power, control, information, data or others.

Full decentralization would mean decentralizing speech and voices, decision-making power and thought leaders. Crypto art platforms and the community that forms around NFTs (mentioned in section xxx) are working towards this goal.

However, high profile institutions like Christie's, still mostly feature the same people as "blockchain art referents", which contradicts the basic premise of decentralization.

[5]Maria Paula Fernández and Stina Gustafsson, Interview with Ruth Catlow, 'Radical Friendship, Cooperation, And Transnationalism: In Conversation With Ruth Catlow' (2019). https://medium.com/ethberlin/radical-friendship-cooperation-and-transnationalism-in-conversation-with-ruth-catlow-15917c71dfd5

Decentralization does not equate to adoption or involvement. Having democratized access does not mean that new voices are forced to join the conversation. We hope that they will once barriers to access are removed but this is not a direct correlation for what decentralization means.

During our research, we have identified established collectives such as Furtherfield [6]working as hacktivists and artists, and seamlessly integrating both practices. Notably, these collectives and artists are not the first ones that pop to mind (or on Google) when talking about art and blockchain.

In an attempt to rationalize the phenomena, we noticed that such artists and collectives have a long history of research in the fields of technologies, societies, and systems. Some of them are also coders, cryptographers, privacy researchers or even lawyers. These people, we believe, have integrated the values of decentralization, anonymity and data sovereignty into their personas and work. Therefore, the works produced by them become complex pieces of technology, interdisciplinary artworks with myriads of layers to analyze. Some of these layers can range from critiques to the legacy systems, the functionality of the artwork itself, the underlying technologies used to create the artwork, and the manifestation of the societal problematics they see through creation, among others.

The paper aims to bring to highlight these individuals and collectives, and push forward the collaboration of mainstream artists and blockchain, holistically by dissecting all factions in the so-called "blockchain art" realm.

Digital art marketplaces are not Blockchain art

Working on the decentralized ecosystem, it's frequent and refreshing to get to know the newly denominated crypto artists. These artists mainly come from a graphic design/motion graphic background, but, what is more interesting, is that coders and other community members are dipping their feet into creating their own illustrations, and submitting them to popular marketplaces for digital art, such as superrare.co, digitalobjects.art, or knownorigin.io.

Whether these creations are considered art or not, is something we would like to set aside, to explain further which digital art marketplaces are not blockchain art. The mere action of submitting an image asset to one of these platforms does not imply that the image will be considered art.

For instance, from the superrare.co[7] website:

"Rare digital art, aka crypto art, is limited-edition collectible art cryptographically registered with a token on the blockchain. Blockchain technology allows unique, provably-scarce tokens

[6] Furtherfield website: https://www.furtherfield.org/

[7] Superrare website: https://superrare.co/about

to be held and securely traded from one collector to another. They represent transparent, audit-able origin and provenance for a piece of digital art."

Even though we highly respect the contributions of the superrare platform to the space, we see this statement as false. The artist/illustrator/aficionado indeed submits the asset to the platform, and the platform then mints a unique token to mark the provenance, authenticity and scarcity of the asset (the token is the ERC-721 standard). ERC-721 tokens can be minted for many uses, two of them being for collectibles and artworks. **The line between collectibles and artworks is blurred in this case, as the blockchain ecosystem tend to use the two words as synonyms.**[8]

However, the asset exists without the Blockchain and does not need the technology to exist. The asset is as unique as the creator wants it to be, based on the decision to reproduce it. To call the combination of the digital asset + a platform automatized token attached to it - is equivalent to attach a piece of paper to a sculpture. The sculpture is still the artwork.

For instance, Peter Burr is an established artist and some of his pieces are currently on sale at Digital Objects[9]. As mentioned on the website: Architecture Machines (Monument #1 and Monument #2) is a series of speculative urban labyrinths. They are digital art pieces, and as listed on the website - they have the following features:

- A permanent cryptographic title of ownership (ERC-721 token)
- A hi-res digital media file
- The ability to resell
- This piece added to your public collection

One of the authors of the paper purchased Edition 8/10[10] of Architecture Machines Monument #1. Indeed, the piece cannot be downloaded without being purchased, however external screen captures might be possible - although of course, not authentic. The piece, without the certificate of authenticity, would still exist. The ability to resell the piece would also be possible without a blockchain, as well as adding this piece to a public collection. The owner believes that the value of this particular piece relies, not in the NFT attached to it (ERC-721), but on the digital art by its own. With or without the Blockchain, the purchase would have still happened.

In any case, it is undeniable that even though the act of attaching an NFT to a digital artwork does not constitute blockchain art for the authors, the discovery and subsequent ownership of art are more diversified and processes made easier thanks to digital art marketplaces.

Therefore, digital art marketplaces are extremely useful to solve problematics that the art world has had for a long time, such as forgery, issues with provenance and secondary markets where the artist mostly does not see profit. The authors firmly believe that digital art marketplaces have the potential to democratize art, make it accessible to more people,

[8] https://www.artnome.com/news/2018/1/14/what-is-cryptoart
[9] https://digitalobjects.art/artwork/378757845539553281
[10] https://digitalobjects.art/superm

and facilitate and improve the current art market conditions, Salomonic tasks each on its own. But as any art marketplaces, they do not become part of the art.

Artists Taking Control of the Secondary Sales Market

Artists have been using technologies to find ways to sell, resell, commoditize, and validate their resale rights for a long time.[11] In Sam Hart's presentation, Artificial Scarcity, he introduces that reproduction/resale rights have been being studied and formalized for more than a century. The first notorious case is Droit de Suite (ca. 1893 - went into effect in England in 2011) states the right of artists to pass into their heirs to receive a fee from the resales of the artworks. This requirement was criticized for the disadvantages it presented to art newcomers and students - and cryptoart marketplaces can help alleviate this.

"[...] it is scholarship which potentially can suffer the most. Certainly sales will be made, ownerships transferred – the question is more one of how public such transfers will be, and how many will actually leave a paper trail. The result: provenance, one of the most significant factors in valuing and in researching a work of art, will often be lost."[12]

As observed before in the analysis of digital arts marketplaces, and in this paper, in the provenance section below, the issues with transferring ownership, provenance and paper trails make a strong case for Blockchain technologies.

Artists, as Hart indicates, have been campaigning actively on raising awareness about their reproduction and resale rights. One of the examples noted in his presentation is Caleb Larsen's A Tool To Deceive and Slaughter (2009), which Hart describes as:

"The sole function of Larson's black box is to auction itself on eBay after each resale, using the infrastructure of the digital economy to create a self-propagating, serialized performance"[13]

In a Wired interview, the artist explained the technology behind his work:

"Inside the black box is a micro controller and an Ethernet adapter that contacts a script running on server ever 10 minutes. The server script checks to see if box currently has an active auction, and if it doesn't, it creates a new auction for the work. The script is hosted on a server to allow for updates and upgrades if and when the eBay API (the interface used for 3rd party programs to talk to eBay) changes.[14]

[11] Sam Hart, Artificial Scarcity, 2018
https://arena-attachments.s3.amazonaws.com/2126008/c7f3aed8df5ff8a62792770e422651f8.pdf
[12] Abigail Lesman, The Droit de Suite Dilemmna, Forbes;
https://www.forbes.com/sites/abigailesman/2011/12/21/the-droit-de-suite-dilemma/#5c4bd9f87ae9
[13] Sam Hart, Artificial Scarcity, 2018:
https://arena-attachments.s3.amazonaws.com/2126008/c7f3aed8df5ff8a62792770e422651f8.pdf
[14] https://www.wired.co.uk/article/artwork-selling-itself-on-ebay

Caleb Larsen's A Tool To Deceive and Slaughter (2009)
Source: www.wired.co.uk/article/artwork-selling-itself-on-ebay

The choice to use the eBay API is still to date, correct, and even though smart contracts could do exactly the same if programmed correctly - we see that the below benefits of Blockchain technologies, and in particular, smart contracts rely on their flexibility to be a "one stop shop solution" for additional problems within the regular art marketplaces.

Blockchain technologies allow artists' full, transparent and almost seamless ownership and full rights of their productions (given - of course - that they do their due diligence and learn to pick the right platforms. The authors hope that this paper will help on this matter.)

The Meme Wars

Are memes art? Memes are an integral part of the communications, controversies and events within the Blockchain ecosystem. They communicate more than blogposts,[15] and due to its simplicity, they can quickly become viral and widespread.

The Blockchain community does consider memes as art, as we were able to gather from the Görlicon discussion on January 31st, 2019. From an artistic critique perspective, we could dissect memes as art pieces in the following way:

- A digital image is created and/or reused
- A message is attached to the image - this is usually a meta-message expressing an opinion or a critique towards an event happening within the blockchain ecosystem
- The meme can or can not become viral. If the meme does become viral, the people sharing it can incite a movement
- The meme can be repurposed with other messages, henceforth reproduced as well, without any licensing needed

[15] https://www.smithsonianmag.com/arts-culture/what-defines-a-meme-1904778/

- The meme sends an effective and easy to grasp message, and on some occasions it can contribute to changes such as company policies, groupthink, wider awareness about a problematic in the space, etc

From the most of the art world's perspective, memes are not considered art, and if introduced on art shows, they just add "color". SFMoma put together an exhibition that featured some well-known memes, however the ephemeral nature of memes was deeply criticized.[16] Ephemerality is not something that an art piece normally seeks, it is commonly about making a lasting impression. However, we need to acknowledge that are a whole practice of art simply called Ephemeral Art, including happenings, performances and sound sculptures.[17]

Too many precedents of memes featured in art galleries, museums[18], shows and art shows - Queen's Museum has featured an entire show called "Two decades of Memes" defend the statement that memes are art.[19] We believe that discussions prove that memes (as analysed above), are indeed considered art in some spheres and critiques should be dissecting them to understand the true value behind a meme, that oftentimes is first perceived in the tech industry, defining a specific event or time in culture and society.

Is Malware Conceptual Art?

During the discussion that preceded this paper, there were some proponents that malware and bugs could be classified as art. This was inspired by Banksy's self-shredding art piece happening.[20]

This is an interesting viewpoint, however technological flaws are not art. For instance, a bug in an airplane navigation software can end in a tragedy. Software and hardware security cannot be classified as simple manifestations of art, in as much as they can destabilize entire systems and cause terrible issues.

The art world has been rubbing elbows with the threats of the cyberworld by forcing blockchain into their work without understanding the advantages and disadvantages of the technologies. This is when bugs really come into play.

[16] https://www.sunjournal.com/2019/04/10/museums-should-be-careful-about-showing-you-memes/
[17] 'Ephemeral Art – Art Term | Tate' (*Tate*, 2019) [https://www.tate.org.uk/art/art-terms/e/ephemeral-art] Accessed: 23 May 2019.
[18] https://www.washingtonpost.com/entertainment/museums/museums-wants-2-show-u-memez-now-they-shud-be-careful/2019/04/05/6a44b5a4-559d-11e9-814f-e2f46684196e_story.html?utm_term=.7e3282b23515
[19] https://www.vice.com/en_us/article/j54897/memes-have-finally-made-it-to-the-museum
[20] https://www.latimes.com/entertainment/la-et-cm-banksy-shreds-painting-20181006-story.html

For instance, artist duo Broomberg and Chanarin introduced a piece classified as “blockchain art”[21], marketed via Collecteurs.[22] The piece, from their thought-provoking series “Spirit is a Bone”, that, quoting the artists:

“This series of portraits, which includes Pussy Riot member Yekaterina Samutsevic and many other Moscow citizens, were created by a machine: a facial recognition system recently developed in Moscow for public security and border control surveillance. The result is more akin to a digital life mask than a photograph; a three-dimensional facsimile of the face that can be easily rotated and closely scrutinised.”[23]

Screenshot from the video of the Collecteurs edition of Broomberg & Charnarin’s Spirit is a Bone: https://vimeo.com/329227335

Spirit is a Bone was marketed by Collecteurs, that introduced it as “aimed to bring awareness towards blockchain technologies”. The piece features a certificate of authenticity by Verisart, [24] a well known platform built on the Bitcoin blockchain, and as explained by the platform, is tied to a smart contract which enables it to generate revenue for the artists when the piece gets sold again[25]. The paper authors got in touch with the sellers (Collecteurs) via Instagram on one of the images,[26] asking for a clarification on the usage of the technologies, however the answers were unsatisfactory, and technically not correct.

[21] https://vimeo.com/329227335
[22] https://www.collecteurs.com/
[23] https://www.broombergchanarin.com/#/spirit/
[24] https://verisart.com/news
[25] https://www.kickstarter.com/projects/collecteurs/collecteurs-the-crowdsourced-museum-of-the-future/rewards
[26] https://www.instagram.com/p/BwCZyPiDHzx/

Upon looking into the Verisart and Collecteurs websites, there is a total lack of documentation and even simple explanations about what the platforms do, how they work, or what the buyers are purchasing. Verisart's website features an API guide, which is not readable for the end-user, or for the artists choosing the platform.[27] Therefore, these platforms and technologies are being adopted without due diligence from buyers and artists. If there is no educational materials and documentation, there is no awareness, only marketing tactics to adopt new trends.

The art world is in critical need of education to integrate blockchain technologies. The artist must understand the functionalities and downsides of smart contracts. In this case, a bug in the framework/smart contract or app would destroy the original plan of the artists.

Artists and collectors know how the regular art market works, the process of authentication, and their rights. Therefore, they can make educated decisions about their careers. The attempt to introduce blockchain without knowing its caveats or functionalities might result in not only reputation loss for the artist and the platform - if the artwork integration with the technology is forced or perceived as far fetched - but most importantly might expose the artists to new problematics, as security breaches and loss of funds due to smart contract vulnerabilities.[28]

[27] https://verisart.com/developers
[28] https://hackernoon.com/smart-contract-vulnerabilities-remain-a-clear-and-present-danger-59acaf82213f

Art Informed by Blockchain is not Blockchain Art

The intersection of blockchain and art is, as expected, not strictly limited to art existing on the Blockchain, but is also consisting of art informed by the culture and ethos surrounding the community, as well as the technological aspect and ideas behind it.

Kei Kreutler, *The Pareto Deck: 5 of Forks,* 2018, acrylic on canvas, 140 cm x 80 cm x 2 cm (left), *The Pareto Deck: 2 of Swords*, 2018, acrylic on canvas, 140 cm x 80 cm x 2 cm (right).
Photo: Hans-Georg Gaul.
Source: www.spikeartmagazine.com/en/articles/i-wanted-protocol-identify-community

With pieces such as Kei Kreutler's The Pareto Deck: 2 of Swords and The Pareto Deck: 5 of Forks, this section of Blockchain art is noteworthy as it visualizes concepts and ideas which commonly are foreign for people who aren't involved or connected to the community. These artworks might not only act as an exploration of the thematic, but also an explanation for a wider audience, arguably paving the road for a wider understanding, and potential adoption, of the technology.

This segment of the intersection of art and blockchain is possibly the one that has had the widest recognition within the traditional art market, as it can be seen as a connection for communities which aren't associated with or to Blockchain technology and the culture surrounding it. It has the possibility to explain complex ideas in a simplified manner, therefore bridging the ideas behind Blockchain with different communities on the outside.

It also has the physicality, which is commonly expected within art and for artworks, and potentially appeals to the traditional art market more due to this – physical piece is arguably perceived as more valuable than something digital as the physical aspects makes it less abstract for the owner. It could be that this idea is more appealing to an older audience, which might expect art to have a physical presence, while a younger and newer audience is more comfortable with the digital aspects of art with an existence that is directly tied to the Blockchain technology.

Oh, But There's Blockchain Art Out There: Blockchain Use Cases for Physical Art

Case Study: Jonas Lund and the JLTs

Besides the artworks informed by the many complex ideas, ethos, culture, and subjects behind Blockchain technologies, as well as the wider culture surrounding it, art with an existence that is directly tied to the technology is also an important part of this intersection. Unsurprisingly, the shape of this is in many cases digital and thus can, by many, perceived to be more ephemeral. However, it needs to be mentioned that in some cases the pieces have both a physical and digital presence, such as a physical print and the digital certificate which states the smart contract, the token or any other part that connects the piece to the Blockchain.

Arguably, works with both a physical and digital/Blockchain presence, need to be able to combine both these elements in a way which shows understanding for both communities. Commonly, the traditional art market has favored already known names such as Kevin Abosch, Ai WeiWei and previously mentioned duo Broomberg and Chanarin, even though some of the projects have felt seemingly forced and as if they were lacking knowledge about the technological features of Blockchain. That being said, some of the projects by these artists does demonstrate an understanding and respect for both elements, Kevin Abosch's IAMA Coin[29] and Eve Sussman's 89 Seconds Atomized, which was created together with the technological art lab Snark.art.[30]

However, there is another community which has been working with the understanding and development of the ethos and technologies much longer than previously mentioned artists and has a much deeper knowledge of both the technological side and creative side of Blockchain. During our conversation with Ruth Catlow, previously mentioned in this report, she mentioned artists such as Rob Meyers, Primavera De Filippi and Jonas Lund, and the way

[29] Full description can be found on the following website: https://iamacoin.com/
[30] Full description can be found on the following website: https://snark.art/89seconds

they work with "the relationship between art, technology, and the social impact of these things together."[31]

> *"I think the value of them is that they, they look for ways to increase the expressive range - by which I mean the work can be made in a way it can be experienced. They also do create new markets, but also new ways for people to perceive and receive. Oftentimes, the innovation lies in the transmission and reception of the work. And it's all very social [...].* "[32]

Jonas Lund's tokenization of his own practice, for "which the artist has created 100,000 shares in his artistic practice"[33], allow shareholders (each share is represented by a Jonas Lund token) to take part in the voting in strategic decisions concerning Lund's artistic practice. The piece is an interesting comment on a practice which in many cases is considered to be a subject which doesn't represents an artistic interest. It this case the creative approach and solution has become far more clinical and technical than what we normally expect from artists.

Lund proves deep knowledge on Ethereum smart contracts[34] and the concept and functioning of DAOs (Decentralized Autonomous Organizations) on which he inspires his Decentralized Autonomous Practice. Additionally, he proves understanding how the Open Source world works by setting up bounties[35] (see section - Blockchain for Coordination) through which upon completion, participants are rewarded with tokens, designing an incentive mechanism that enables more shareholders to participate on his Decentralized Autonomous Practice. Lund taps into his own governance mechanism, only accessible and visible to JLT token holders.[36]

The website for this Decentralized Autonomous Practice also features a clean and easy UX, able to even contribute to the education of the art world. Consequently, the authors consider Jonas Lund's JLT as one of the most interesting and complete "blockchain art" proposals to date. Blockchain is creating the base for the whole piece – without the Ethereum contracts there would be no shareholders, and thus Lund would be the sole person making decisions about his creative practice. Besides this aspect, which is depending on Blockchain for its existence, the piece has several different physical pieces, ranging from the Jonas Lund Token (JLT) – PopSocket (a limited edition of 36, each PopSocket comes with a token) to the pieces that was showcased in Proof of Work at Schinkel Pavillon, Berlin, in

[31] Maria Paula Fernández and Stina Gustafsson, Interview with Ruth Catlow, 'Radical Friendship, Cooperation, And Transnationalism: In Conversation With Ruth Catlow' (2019). Published interview can be read here: https://medium.com/ethberlin/radical-friendship-cooperation-and-transnationalism-in-conversation-with-ruth-catlow-15917c71dfd5

[32] Ibid.

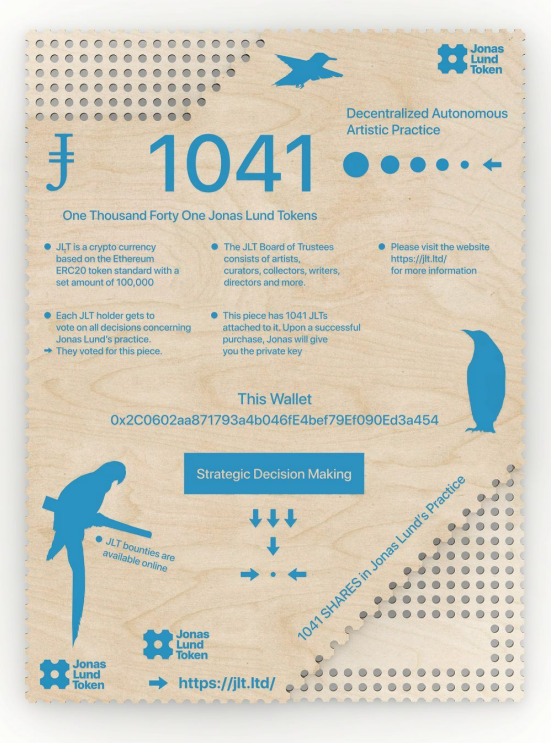
[33] 'Jonas Lund Token (JLT)' (*Jonas Lund Token (JLT)*) [https://jlt.ltd/about/] Accessed: 30 April 2019.

[34] For more info please visit: https://etherscan.io/address/0x6E146C41547826a939794d64d53dB22A99423d8c#contracts

[35] For more info please visit: https://jlt.ltd/jlt-bounties/

[36] For more info please visit: https://jlt.ltd/tokens/

2018. The piece, Jonas Lund Token (JLT) 1041, is a wall piece made of CNC and engraved wood and acrylic, andhas a stated value of 1041 [...] and its unique cryptographic "hash" number as a part of its form"[37].



Jonas Lund, *Jonas Lund Token (JLT) 104*, 2018, CNC & engraved wood, UV print, acrylic paint, 120 × 90 × 3 cm.
Source: jonaslund.biz/works/jonas-lund-token-jlt-1041

By using art to raise questions about collective governance, Lund's pieces are excellent examples of art that is what could be defined as "blockchain art", as they not only open up for wider discussion, but are also, indeed depending on the Blockchain to exist.

Besides the technical competency and artistic talent Jonas Lund possesses, the challenges the artist proposes to himself and his practice are very much in line with the ethos of the technologists of the Blockchain ecosystem. Technologists build and decentralize the control of their tools and protocols - until a point some of the projects ultimately are released for the community to govern and maintain. For instance, Golem[38], one of the oldest dApps in the Ethereum Ecosystem, is currently building a p2p marketplace for computing power on which the users can take control of their resources and developers can build applications on top of the protocol - ending the AWS/Cloud monopolies and decentralizing their own "cloud". The project's goal is that once the protocol is in a robust phase, integrations/software will not be built anymore by the team. The final stage of the Golem Project is to release the platform from the team control, set it free, and see how the community decides on it, changes it, and maintains it. Jonas Lund understands that to

[37] Simon Denny and Melissa Frost, *Art/Cryptocurrency: Proof Of Work* (n/a 2018) [http://www.launayau.de/wp-content/uploads/2018/10/ProofOfWork.pdf] Accessed: 20 April 2019.
[38] For more info please visit: https://golem.network

achieve full decentralization - one must allow the users/shareholders to fully control the artworks and his practice.

Case Study: Felix González Torres but on the Blockchain

Felix González Torres was an artist who focused some of his body of work towards a playful approach to reproduction.

"In 1989 Gonzalez-Torres began making his stack pieces: blocklike stacks of paper printed with content related to his private life, from which the viewer is invited to take a sheet. Rather than constituting a solid, immovable monument, the stacks can be dispersed, depleted, and renewed over time."[39]

Felix González Torres, Untitled (1988) (https://tit-assets.s3.amazonaws.com/articles/117/Felix-Gonzalez-Torres.-Untitled.-1988__large.jpg)

The artist used materials such as candy, light strings, and the aforementioned stacks - which the spectators were encouraged to arrange in however way they desired.
What is interesting about these particular participatory artworks, is that each of them is governed by a Certificate of Authenticity. This Certificate describes the dimensions, materials and even explains the obligations the owners need to comply with regards to the artwork.

It is interesting to imagine how González Torres would do it with the tools that blockchain provides. A physical artwork governed by a smart contract, connected to an oracle that is also connected to an IoT device, which would make sure that the instructions are followed correctly. Upon failure to follow these instructions, the IoT device could send a signal to the

[39] https://www.sfmoma.org/artist/Felix_Gonzalez-Torres/

oracle, which would validate or not the actions of the collectors, and deploy certain functionalities of the smart contract, even causing the certificate and contract to self-destroy.

In conclusion to this short section, what was impossible in the times, for instance, of Felix González Torres but would have been incredibly coherent with his work, would be possible - and even easy to assemble - with the features Blockchain enables. The interaction between the physical artworks and technology - as we have seen in the Blockchain Art exhibition Proof of Work at Schinkel Pavillon in 2018 - is an area to continue exploring and even consider for established artists.

Blockchain Against Forgery

In 2018, a museum dedicated to 19th-century Fauvist Étienne Terrus (1857–1922), was alerted by a visiting art historian that there was something suspicious about the paintings. The museum, located in the artist's tiny hometown Elne, was in for a shock – about 60% of the paintings turned out to no have been painted by Terrus himself, they were in fact fake.[40]

What is interesting about this story is that it hints at to what extent fake and forgery is a part of the art market – it is nothing new and there are a lot more out there then what most people would like to admit.

Interesting enough, during our discussion on the 31st of January this year, the topic of forgery within digital art was raised and it became clear that there was a feeling that digital art can be forged more easily than something like traditional painting. However, as we can learn from the story above, forgery has always been there and is not a new topic when it comes to digital art.

With the introduction of NFTs such as ERC-721, forgery of digital art is taking a big step towards complicating potential forgery and fakes on the market. Digital certificates like this doesn't only act as a prevention against fakes and fraud, but also states provenance, and by being directly tied to the Blockchain, information becomes more secure.

Blockchain as Proof of Provenance

The issues with provenance and forgery are perhaps the areas where blockchain technologies offer the most promising solutions. Much has been said and done in these areas. The big debate on provenance in the last 10 years started when the novel "Provenance: How a Con Man and a Forger Rewrote the History of Modern Art"[41] by Laney Salisbury and Aly Sujo was published in 2009. Back then, Bitcoin was rarely heard of, as the whitepaper[42] was only published on October 31st, 2008.

[40] Henri Neuendorf, 'A French Museum Just Discovered That Half Of Its Collection Is Fake | Artnet News' (*artnet News*, 2018) [https://news.artnet.com/art-world/france-terrus-museum-fake-art-1275536] Accessed: 29 April 2019.
[41] http://www.artcritical.com/2009/08/01/provenance/
[42] https://bitcoin.org/bitcoin.pdf

Blockchain technologies provide various alternatives for tracking, storing data immutably (given the project builders take their code through audits ensuring this). By storing records and documentation in a particular blockchain, these records become immutable. Tracking down the provenance of things, whether the use case is art or for a supply chain, becomes transparent, immutable and secured thanks to various protocols solving these matters. The protocols then may use NFTs (ERC-721) or other tools to issue tokens that ensure the data will not be tampered with.

Some examples of permissionless art registries, where anybody can upload a work, are Codex Protocol[43] built on Ethereum or Verisart[44] built on Bitcoin. They, however, suffer from the problem referred to as "trash in trash out". The famous case of Terence Eden uploading the Mona Lisa to Verisart is the perfect example of this issue:

"I don't understand the blockchain hype. A startup has certified my artwork & placed their verification on the bitcoin blockchain. Now art dealers & auctioneers can feel secure that I am the original artist. One small problem... I am not Leonardo da Vinci!"[45]

Artory, another art registry on the Ethereum blockchain, found a solution around this problem by only working with vetted partners, like auction houses or appraisers, who are the only ones who can upload artworks to the registry.[46] This means that they are using the current trust system of the art market, not the new trust systems offered by the blockchain technology.

Anna Bews, product owner at Artory explains that *"[...] using blockchain technology allows unprecedented provenance and record keeping. The simple aspect that it enables verifiable and immutable information, emphasizing the importance of the power of the community, makes the difference. Considering the reoccurring difficulties in the established art world, that should be something everyone is looking for."* [47]

While Artory is a great use case for the art market to become more technology-oriented, the solution they offer is still quite centralized around a few vetted actors and does not fully utilize the potential of the blockchain. As it relies on existing trust systems, Artory registry has been of interest to actors of the art market, such as Christie's auction house with whom Artory partnered to record their first sale on the blockchain in October 2018[48].

However, we must ask if the use of blockchain-based art registries is very effective for physical artworks for a multitude of reasons:

[43] https://codexprotocol.com
[44] https://verisart.com/
[45] https://verisart.com/works/23f2c64a-08c6-4a42-8013-84ac8422dffb
[46] https://www.artory.com/how-it-works/
[47] Email: Anna Bews to Stina Gustafsson, 'Blockchain And Art - How It's Changed Provenance Etc.' (2019).
[48] https://news.artnet.com/market/christies-artory-blockchain-pilot-1370788

- The link between the physical object and its digital record on the blockchain still needs to be refined with IoT solutions and unique identifiers that won't be able to be removed from the artwork and placed on a fake one
- One still has to rely on the previous offline transaction record, which makes the blockchain records only partial and therefore not very useful
- It will take time for art collectors to rely on the blockchain technology without the intervention of art experts and appraisers to confirm the digital record

This leads us to think that the most appropriate use cases of blockchain for provenance and authenticity would be around digital art for now. It is also where the most opportunities lie to create a new digital art market from the inception of the work.

Blockchain Use Cases for Digital Art

Walter Benjamin in the Times of NFTs

In 1936 Walter Benjamin first published his essay *The Work of Art in the Age of Mechanical Reproduction*, in which he argues that a reproduced image, such as a photo or film, has lost its singularity - its aura.[49] Benjamin suggests that "from a photographic plate [...] many prints can be made; [hence] the question on genuine print has no meaning."[50] The act of reproduction takes away from the pieces and makes it less sacred – the singularity has ceased to exist. While Benjamin only talked about photo and film, in the modern area this argument can also be applied to edition prints, as they are not about the singularity, but rather the opposite.

Just like with the mechanical reproductions Benjamin mentioned, it can be argued that the notion of singularity was never introduced to digital art and collectibles, as pieces like this are easily reproduced and copied. Arguably the digital file has no limit in term of times it can be reproduced, and thus the presence of an aura has always been lacking.

However, with the introduction of non-fungible tokens, digital scarcity is now a part of the practice. Arguable, with this introduction, the singularity has been reintroduced, or even introduced for the first time. What Walter Benjamin argued that the technological developments took away in the 1930s, has, again through technological developments, been introduced on the digital art scene. Arguably digital scarcity is securing the uniqueness of each piece - as mentioned before, its aura, therefore allowing the market to associate a value to digital pieces.

History of NFT Standards

One solution to the art provenance and authenticity problem came with the non-fungible token (NFT). A non fungible token is a token representing a unique asset and not stocks or currency units that are all similar (fungible) and interchangeable. The unique (non-fungible) aspect is perfect to be a representation of unique assets on the blockchain, such as artworks.

"It is a virtual token that you create to verifiably prove authenticity and ownership of an asset, through cryptography. It is a type of token that creates digital scarcity, and can be verified without any centralized organization that authenticates it."[51]

Early NFT projects have been developed on the Bitcoin blockchain like Spell of Genesis or Rare Pepe. But as Tomaino puts it, "There is no interoperability in UX or standards for this

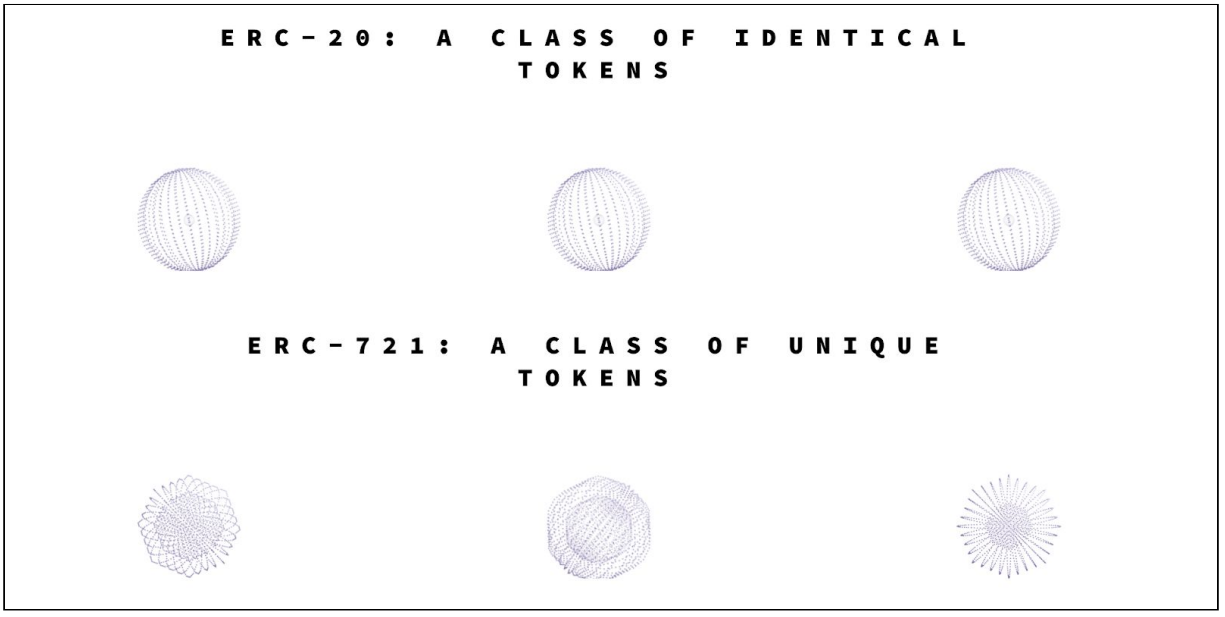
[49] Walter Benjamin, trans. J. A Underwood, *The Work Of Art In The Age Of Mechanical Reproduction* (Penguin 2008).
[50] Ibid.
[51] https://101blockchains.com/non-fungible-tokens-nft/

first-generation of collectibles and there's also not much programmability to enable gameplay or other dApp experiences on blockchain." [52]

The first limited-edition NFT project was Cryptopunks, released by Larva Labs in May 2017, that issued 10,000 punks on the Ethereum blockchain. Each punk was a modified version of an ERC-20 fungible token to make each of them unique. The reason why Cryptopunks and the following art projects have been developed on the Ethereum blockchain is summarized here by John Watkinson, co-founder of Larva Labs: "Larva Labs chose the Ethereum blockchain because it supports the generation of unique ERC20 tokens rather than a simple numeric balance. "Something like the Bitcoin blockchain doesn't have enough expressiveness for this kind of project. Ethereum seemed like a natural choice, with its popularity and its very general Solidity contract language," said Watkinson".[53]

Following this first "punk" experiment with non fungibility and limited editions on the Ethereum blockchain, Cryptokitties appeared and was the first digital collectible project to use the ERC-721 protocol as the industry standard for Non-Fungible Tokens on Ethereum. All projects thereafter have been following this standard protocol for their NFTs.

More recently, ERC-1155 has also being adopted, which is compatible with ERC-721 but allows the creation of mixed fungible and non-fungible tokens within a single contract[54].



Source: http://erc721.org/

Punks and cats might not appear to be revolutionary: their artistic value is questionable and the price is low, but for the first time a value could finally be attached to these digital assets. A gif, jpeg or a video can now be provably rare with an edition size, a chain of transactions

[52] https://thecontrol.co/digital-collectibles-a-new-category-of-tokens-emerging-fb991c1dff6a
[53] https://www.ethnews.com/the-coming-age-of-digital-collectibles-cryptopunks
[54] https://101blockchains.com/non-fungible-tokens-nft/

showing its provenance and a link to its author proving its authenticity. With these elements, a market value can now potentially be attributed to the work.

The term "rare art" appeared at the first rare art festival in January 2018 in New York and has spread ever since - as the second edition of the festival (Rare AF2) in May 2019 showed. [55]

It is important to note that in the case of digital asset, there is no issue with the link with the physical object as seen previously as the artwork/object is already digital, allowing for all information (also called metadata) to be stored within the smart contract.
Copying and pasting the image is still possible (and encouraged on social media) but only the minted NFTs have value and can be traded from one owner to another.

Applications for NFTs

Gaming

As mentioned above, Cryptokitties was one of the first games to use the ERC-721 standard for NFTs and consists of collecting digital cats, breeding them to create a new cat.

A more recent example of a blockchain-based game that is getting traction is Neon District, which auctioned their main character, "the boss" on opensea.io for over $20,000.[56]

Gamers can now purchase avatars on blockchain-based marketplaces and use them in their favorite blockchain games. The game provides a perfect context in which to enjoy and use the NFT.

Cryptovoxel provided the first virtual context to present exhibitions of art NFTs within the game in collaboration with art NFT platforms and individual collections.[57]

This is only the beginning of such experimentations with NFTs and platform resistance.

Collectibles & Digital Art

While collectibles are gaining traction with gaming, digital art models and platforms still need to prove their models.

Many reproduce the existing online marketplace model of Artsy or Artnet on the blockchain, such as Superrare, KnownOrigin or Rare Art Labs. With some variations, they still give collectors access to an artist page, an artwork detail page, and a provenance tracking.

New business models emerge as well and have to be closely monitored, such as Editional[58], a mobile app that allows anybody to create, gift or sell their own NFT collectible created in the

[55] https://www.eventbrite.com/e/rare-art-festival-tickets-60307156328#
[56] https://opensea.io/assets/0x1276dce965ada590e42d62b3953ddc1ddceb0392/1
[57] https://twitter.com/creative_crypto/status/1131324242749001732
[58] https://editional.com/

app and users to claim, exchange and trade them. Sort of an Instagram for creatives, which experiments with all the possibilities given by ownership and scarcity.[59]

Licensing

Self-Enforced Royalties & Copyrights

Smart contracts can define the royalties that artists will receive for secondary sales of their art, allowing via code what the law is currently preventing them from receiving in most countries that don't have a droit de suite.

Many platforms are currently using it but there are a lot of issues that remain to be discussed and resolved, such as:

- the platform resistance of the smart contracts: if an artist try to resell their art NFT on a third-party platform, the royalties might not be enforced
- the massive amount of technical and legal coordination required to enforce these contracts if anything goes wrong, for conflict resolution that will still require law enforcement for a long time
- the complexity of current copyright law might not be easily translated into code (especially for non developer actors)[60]

[59] https://coinjournal.net/facebook-veterans-launches-blockchain-based-social-app-following-us1-5m-seed-funding/

[60] https://academic.oup.com/ijlit/article/26/4/311/5106727#122970885

Blockchain for Coordination

There are several structures in the blockchain world that can be perfect coordination mechanisms to organize the art world.
The Open Source realm, where blockchain originates, has been sustaining itself via coordinated efforts of paid and unpaid collaborators for decades. Open platforms built on contributions which lead to the completion and maintenance of software projects have been running for decades.

From Github and other repositories,forums, issue trackers (there are some more evolved than Github's built-in one) and more, the Open Source community has always been trying to achieve the goal to build asynchronously, yet coordinated.

With the arrival of blockchain, these tools evolved into Cryptocurrency-based Bounty Platforms, DAOs (Decentralized Autonomous Organizations),[61] voting mechanisms, prediction markets and more.

The universal coordination machine that is Open Source software development, and blockchains as propellers for fairer and more transparent coordination mechanisms can provide robust tooling for the coordination of the art world, whether it's for marketplaces, provenance, licensing - or even for massively coordinating and diversifying commissioned work or large interdisciplinary art projects that need artists from all over the world to become a reality.

How Open Source Does Collaboration Right, and How the Art World Can Benefit
Open Source Software development has multiple learnings that the artworld can benefit from. The introduction of blockchain and cryptocurrencies into the space has generated more avenues to get funding, transact and exchange knowledge for these developers.

Some platforms have a "bounty based" approach, where a team, individual or company decides they need to externalize a particular task, and what they do, is simply post it on a bounty platform (Gitcoin [62]and Bounties Network being the most used ones on Ethereum), where a person can pick it up, and get paid upon completion and approval of the quality of the task completed. It is natural to parallelize this to commissioning artworks, but to a broader audience.

One could choose to "bounty" a commission, and a wide array of artists could look at picking it up. The authors did this with a "meme" a few months ago, resulting in a set of illustrations

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61 https://medium.com/universablockchain/decentralized-autonomous-organization-what-is-a-dao-company-eb99e472f23e

62 https://gitcoin.co/about / https://gitcoin.co/vision

which was paid for via the aforementioned bounties platforms. For the Gitcoin experiment[63], we decided to ask the artist to also submit to a well-known digital art platform, SuperRare. Because of the transparency of the transactions and process, the art world could benefit from these methods.

"Kirk joins the Q Continuum" - Artwork commissioned by ETHBerlin on an open contest, Peter Bock (artist) was paid 50 DAI via Gitcoin for his work, and the artwork was sold to a collector on Superrare for 0.5ETH

A second alternative from Blockchain Open Source funding coordination and funding alternatives that can apply to the art world is OSrank by OScoin. From their FAQs:

"In order to determine how to distribute oscoin to the open source community, we created Osrank. The intuition behind Osrank is that in order to determine the relative value of a software project in the network, we need to leverage the graph of open source dependencies and contributions."

OScoin offers a cryptocurrency that rewards Open Source builders, based on the relative valuation addresses by OSrank. If this would be applied to the art market, we would see a wider democratization of art, as well as adoption of cryptocurrencies and more transparent valuation metrics.

[63] See Bounties Network experiments and See Gitcoin experiment.

Collaborative Artworks Facilitated by DAOs and Other Coordination Methods

Primavera De Filippi's Plantoids, which is built to explain her own research on blockchain technology, makes a rather good example for the structure that collaborative and supporting artworks can take.

The body of the work is made up of robotic sculptures with a software directly connected to a blockchain. Through this software viewers can send an amount of cryptocurrency to each Platoids unique digital wallet. Once the wallet of a Plantoid has reached the pre-decided amount, the software of said Plantoid will commission a new sculpture, which will be made with the money that viewers has sent to its wallet.

The physicality and the appearance of the project takes a back seat in this case, as the idea that it executes is far more interesting due to its direct correlation with collaboration – the Plantoids simply would not exist if viewers wouldn't have donated money to them and the project as a whole would have come to a direct halt.

Collaborative artworks, like De Filippi's Plantoids, is interesting due to its simplification of a collaborative process. By using nascent technologies, it's no longer relying on one owner to drive the collaboration, but rather for the technology and the software to push the process forward. Additionally, collaborative works are also able to explain complex subjects through creativity and thus potentially allows for a wider adoption and understanding.

The Democratization of Art

The notion of democratization of art is not a novel topic, but rather a century old one which keeps on gaining momentum. The idea behind art being something for each and every person, something that should be accessible to all, is the fundamental line in this topic – art is for the many, not the few.

With the advent of photography and the rise of the print press, art became a thing that wasn't directly correlated with singularity, but evolved into multiples and collectibles with an opportunity to reach a much wider audience as it became much more accessible.

Duchamp's readymades and later on the early stages of conceptualism evolved this idea even further, arguing that everything could be art, and what was important was not the object but the idea behind it. Arguably, these movements somewhat liberated art from rigorous structures which allowed it to only be seen and considered as art if it was created within the common notion and structure of what was defined as art.

However, even though the notion of art has changed greatly since before the readymades and the early stages of conceptualism, the democratization of art is still highly discussed and debated. Even though the structures and limitations aren't there to the same extent as it was before, it can be argued that the access to the art world is still favors elitist structures and tendencies. For example, collecting art can indeed be done by everyone, but it also

needs to be remembered that galleries and others alike are highly strategic about the placement of art and thus won't sell any piece of art to whoever wishes to buy it. A well considered placement of a piece can, and most likely will, change the reputation of an artist, and as a result drive up the prices and the value of other artworks by the same artist.

With the new platforms that co-exist together with digital art, which lives on the blockchain, comes a more openness towards the collection of art – if you wish to buy a piece you can indeed do so. Platforms such as digitalobjects.art and SuperRare have taken a step away from the strategic placements which is done by the galleries, and actually allows for whoever wishes to buy a piece of art to do so. However, you can still argue that the strategic placement of a work, even for an artists which sells their work on the platforms mentioned above, can change reputation and prices.

Another interesting aspect of these platforms is the fact that buying a specific artwork does not affect the view or the look of it. A website user will see the exact same piece as the owner, and could with a simple screen capture have a "unauthentic" depiction of the work.[64] Even though buying artwork is indeed about the act of ownership of that specific piece, you can also argue that buying an artwork from one of these platforms is also somewhat about supporting the artist who has created it – the artwork won't change after you have bought it, there is in fact no need for you to buy it to see the original version of it. However, by buying it you allow for the artist to be able to create more pieces that can be bought and enjoyed by yourself, and also by anyone who is using these digital art marketplaces.

The Gold Rush Is Not Over Yet: the Case for Trust-Minimisation in Art Markets and Funding

Just within the last few months there has been an outcry for art institutions to decline funding from foundations or families which has connections to companies which are considered unethical. The National Portrait Gallery in London decided to reject funding from the Sackler family[65], which is strongly linked to Purdue Pharma[66] who created the highly addictive drug OxyContin, after Nan Goldin threatened to cancel her retrospective from the museum's program. Goldin starter the activist group P.A.I.N[67] after she recovered from OxyContin addiction, which she was prescribed after undergoing wrist surgery.[68]

Even though there has for a long time been protests against problematic funding with controversial ties, the transparency that is being demanded by the audiences has created a

[64] See section on digital art marketplaces and case study on Peter Burr's tokenized artworks on page 7.
[65] Kate Brown and Javier Pes, 'In A Landmark Decision, London's National Portrait Gallery Drops A $1.3 Million Gift From The Sacklers | Artnet News' (*artnet News*, 2019) [https://news.artnet.com/art-world/sackler-trust-national-portrait-gallery-1492120] Accessed: 20 May 2019.
[66] Joanna Walters, 'Five More US States Sue Purdue Pharma Over Its Role In Opioid Crisis' (*The Guardian*, 2019) [https://www.theguardian.com/us-news/2019/may/16/purdue-pharma-states-sue-opioids-crisis-role] accessed 23 May 2019.
[67] The full mission statement by P.A.I.N can be read here: https://www.sacklerpain.org/mission-statement
[68] Andrew Russeth, ''They Should Be In Jail': Nan Goldin, Anti-Sackler Opioid Activists Take Fight To Guggenheim, Met -' (*ARTnews*, 2019) [http://www.artnews.com/2019/02/10/nan-goldin-sackler-protest-met-museum-guggenheim/] Accessed: 20 May 2019.

push for a more active consideration of from where the funding is coming and for a more openness within institutions. These tendencies aren't just seen within museums, but also within more market related institutions such as Christie's. You can simply say transparency is the hot topic right now.

Blockchain-based art registry Artory is working on making sales history and collection history more accessible to a wider audience, and with their recent acquisition of Auction Club they will now make sales-records from 4,000 international auction houses available online.[69]

Artory's *"blockchain registry tracks artworks' sale histories, provenance and archival material, effectively leveraging the buzzword du jour when it comes to the art market: transparency."*[70]

With initiatives like this, directly relying on blockchain for its tracking of sales and provenance amongst other things, the technology is opening up for a more transparent approach. It still needs to be remembered that registries are still relying on a third party to submit the correct information, or the whole concept behind it will go amissed. However, as mentioned previously in the report, Artory only works with vetted partners, and therefore it's more likely that the information will be accurate.

Further to this, even though the idea behind blockchain-based registries is an interesting idea, it still feels like the conversation between the two communities, art and technology, is missing and thus the development is not reaching its full potential. While the lack of transparency is a problem in the art world, some of the solutions that has been presented introduce new problems, rather than solving current ones - while the tech community is well adjusted to the use of said systems, the art community has in many cases a long way to go before it will be able to consider the use of it.

[69] Margaret Carrigan, 'Blockchain-Based Art Registry Artory Acquires Auction Club Database' (*Theartnewspaper.com*, 2019) [https://www.theartnewspaper.com/news/blockchain-based-art-registry-artory-acquires-auction-club-database] Accessed: 2 May 2019.

[70] Margaret Carrigan, 'Blockchain-Based Art Registry Artory Acquires Auction Club Database' (*Theartnewspaper.com*, 2019) [https://www.theartnewspaper.com/news/blockchain-based-art-registry-artory-acquires-auction-club-database] Accessed: 2 May 2019.

Conclusion

While we can agree on that blockchain technologies has offered new interesting developments for the art world, there are currently very few real use-cases that truly demonstrate the result and potential outcomes of the intersection between these two industries. The cases that we have seen so far are mainly concentrated within provenance and market development, seen the aforementioned platforms and tools (ERC-721 and marketplaces, supply chain and provenance protocols, etc.) allow these functionalities in a relatively easier manner.

Several degrees of exploration and implementation of smart contracts, mining rigs, algorithms, game theory, and other components pertaining to the technological landscape have been arising within the art world, and some artworks produced have demonstrated the understanding for both the conceptual side and technical correctness, while others have lacked in one or the other.

The first and most logical use case of blockchain within the art market was the blockchain-based art registries, to solve the provenance and authenticity issues. However this does not currently seem to be the most popular as the adoption by art market players or artists is still very low.

The crypto digital art marketplaces - superrare.co, digitalobjects.art, and knownorigin.io to name a few - have seen a spike in users and awareness of a new digital art market, resulting in a growth of the popularity of “crypto art”, becoming more prominent as a discussion topic online and at Blockchain conferences. However, the number of artists using the platforms and collectors who are actively trading has not picked up, and seemed more linked to the hype generated at the beginning within the closed ecosystem. The road to mainstream adoption is still long.

We believe there is a clear disconnection between the two industries: art and tech, and how people within the industries perceive Blockchain art. The authors of the paper consider that a genuine, sustainable connection based on dialogue, information, awareness and collaboration is being worked on by many smaller institutions such as Furtherfield, but is lacking in the higher sphere of the art market.

Education is one of the main efforts we consider core to advancing the efforts of the Blockchain art community forward and what needs to happen is an increase of education in blockchain technologies. There is a struggle to understand the exact benefits of blockchain technologies, partly because of the abstract nature of these - however, the most abstract of technologies, combined with network effects have the potential to be widely understood in a high level, and adopted.

If the learning of the next generation of artists can be facilitated, then more time could be spent on the creative side, allowing for more experimentation with nascent technologies.

Through education, we could also potentially reach the more traditional art market to grasp the benefits of Blockchain technologies. Though initiatives towards this goal are already taking place, the necessary overlap between the industries that is required to validate these efforts from all angles is lacking. The art market tends to organise educational conferences about technology by art professionals for art professionals. This is also present in the blockchain industry, further reinforcing the theory that there is a lack of knowledge sharing. Cross-sector knowledge sharing will lead to innovation within both industries.

The accessibility issues that the blockchain ecosystem experiences at the regular end user level (bad user experience, lack of proper documentation, lack of information for all levels of technical literacy) generate a wider vacuum between both industries, there are still issues with the way some of these platform operates, as there is still a lot of opacity there - it is hard for an outsider to understand how their smart contracts and platforms actually work. Technologists need to be aware that their technologies need to be explained better to all existing and potential users, as they usually don't offer much info on it.

It is also important to realise that the benefits of blockchain technologies can only truly be adopted by a wider audience when the industry is not only reaching out to themselves. This does not only apply to the art market, but all industries that could benefit from the technological developments that blockchain has to offer.

We would like to propose the idea that the players within this intersection work more actively to gather, as a new industry, to organise all the initiative that we currently see on the market, as this could potentially allow for the intersection to gain more recognition. More genuine collaborations across this intersection could also mean an increase of the supply of artworks and quality, and arguably then leading an increase of interest from collectors from both the traditional art market, and the new collectors onboarded through the crypto art marketplaces.

We are aware that such effort will take time and work, but is vital to establish wider credibility within this particular intersection - disorganised initiatives stand the risk of losing vital momentum, due to the lack of conversation and exchange of ideas happening.

Network effects, as the technologists are widely aware of, are one of the most important aspects to consider when building a new platform. In the construction of a Blockchain Art Commons, this needs to be considered. The newfound Blockchain art community needs to also incorporate the coordination aspects that Open Source Development and DAOs have well studied and implemented.

There is a common misconception in the tech world around the premise “if we build it, they will come”. This is proving to be untrue within the new tools and frameworks the decentralized ecosystem is creating. Let us take all the learnings from the technologists, all the memetic power of the art world - and build our own new discipline and community. The Blockchain art community has all the tools, knowledge, creative power, theory, and memes at our disposal. When Blockchain art moon? moon soon.

Glossary

Art Market -

Formed by a primary and a secondary market. The marketplace where buyers and sellers trade in artworks, services, and assets associated with the arts.

Art World -

Wider term than Art Market. The network of people involved in creating, commissioning, showcasing, advocating, criticizing and/or trading art.

Artist -

Anyone who makes a living through their artworks or anyone who practice their artistic skills with the intent to make a career out of it.

NFTs (Non fungible token)[71] -

Non-fungible tokens are blockchain assets that are designed to not be equal. NFTs work essentially as a database entry for any type of good.

Ethereum blockchain[72] -

Ethereum is a global, decentralized platform for money and new kinds of applications. On Ethereum, you can write code that controls money, and build applications accessible anywhere in the world.

ERC-721 -

It is an open standard that helps build non fungible tokens on Ethereum blockchain ERC-721 is a free, open standard that describes how to build non-fungible or unique tokens on the Ethereum blockchain. While most tokens are fungible (every token is the same as every other token), ERC-721 tokens are all unique.

Smart contract[73] -

A smart contract is a computer protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of a contract. Smart contracts allow the performance of credible transactions without third parties.

Token[74] -

A unit of value that an organization creates to self-govern its business model, and empower its users to interact with its products, while facilitating the distribution and sharing of rewards and benefits to all of its stakeholders.

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[71] https://coincentral.com/nfts-non-fungible-tokens/
[72] https://blockgeeks.com/guides/ethereum/
[73] https://blockgeeks.com/guides/smart-contracts/
[74] William Mouyagar, The Business Blockchain http://thebusinessblockchain.com/

DAO (Decentralized autonomous organization)[75] -

A Decentralized Autonomous Organization (DAO) is an organization that can fully function without the usual management structure that involves people. A DAO can also be defined as an organizational system that maintains and sustains itself based on smart contracts in which users determine its direction for the future by election.

Bitcoin blockchain[76] -

The Bitcoin blockchain in its simplest form is a database or ledger comprised of Bitcoin transaction records. However, because this database is distributed across a peer-to-peer network and is without a central authority, network participants must agree on the validity of transactions before they can be recorded. This agreement, which is known as "consensus," is achieved through a process called "mining."

Oracle[77] -

An oracle is a data feed – provided by third party service – designed for use in smart contracts on the blockchain. Oracles provide external data and trigger smart contract executions when pre-defined conditions meet. Such condition could be any data like weather temperature, successful payment, price fluctuations, etc. An oracle, in the context of blockchains and smart contracts, is an agent that finds and verifies real-world occurrences and submits this information to a blockchain to be used by smart contracts.

IoT Device[78] -

IoT is short for Internet of Things. The Internet of Things refers to the ever-growing network of physical objects that feature an IP address for internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems. Examples of objects that can fall into the scope of Internet of Things include connected security systems, thermostats, cars, electronic appliances, lights in household and commercial environments, alarm clocks, speaker systems, vending machines and more.

P2P[79]-

Peer-to-peer, or P2P in its abbreviated form, refers to computer networks that use a distributed architecture. That means that all the computers or devices that are part of it share the workloads in the network. The computers or devices that are part of a peer-to-peer network are called peers. Each peer from a peer-to-peer network is equal to the other peers. There are no privileged peers, and there is no central administrator device in the center of the network.

[75] https://www.investinblockchain.com/decentralized-autonomous-organization-dao/

[76] https://www.ibm.com/blogs/blockchain/2017/05/the-difference-between-bitcoin-and-blockchain-for-business/

[77] https://blockchainhub.net/blockchain-oracles/

[78] https://www.webopedia.com/TERM/I/internet_of_things.html

[79] https://www.digitalcitizen.life/what-is-p2p-peer-to-peer

Crypto -
In the context of the paper, this is an ambivalent term, referring to cryptography (the crypto art is stored in a token via cryptography, but is paid in cryptocurrencies). However, it can also refer to cryptocurrencies.

Cryptocurrencies[80] -
A cryptocurrency is a digital or virtual currency that uses cryptography for security. A cryptocurrency is difficult to counterfeit because of this security feature. Many cryptocurrencies are decentralized systems based on blockchain technology, a distributed ledger enforced by a disparate network of computers. A defining feature of a cryptocurrency, and arguably its biggest allure, is its organic nature; it is not issued by any central authority, rendering it theoretically immune to government interference or manipulation.

Mining Rig[81] -
Mining Rig refers to a computer system that practices to mine Bitcoins/ Cryptocurrency. The rig either be a dedicated miner or a computer. The dedicated miner could procure, built and operated precisely for mining, where a computer fills the requirements, such as gaming system or utilized on only part time-based.

Game Theory[82] -
Game theory is a theoretical framework for conceiving social situations among competing players. In some respects, game theory is the science of strategy, or at least the optimal decision-making of independent and competing actors in a strategic setting.

Open Source Software -
Open source software is software with source code that anyone can inspect, modify, and enhance.

Github[83] -
GitHub is a website and cloud-based service that helps developers store and manage their code, as well as track and control changes to their code.

[80] https://www.investopedia.com/terms/c/cryptocurrency.asp
[81] https://coinpedia.org/information/what-is-mining-rig/
[82] https://www.investopedia.com/terms/g/gametheory.asp
[83] https://kinsta.com/knowledgebase/what-is-github/

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