

Old Wine in a New Bottle: The Integration of the Blockchain and Auctions

Luna Hu



Arts Management & Technology Laboratory

Carnegie
Mellon
University



Arts Management &
Technology Laboratory

Carnegie Mellon University
HeinzCollege

INTRODUCTION

Blockchain, first introduced by Nakamoto Satoshi in 2008, is a public, peer-to-peer ledger on which transactions are permanently recorded and cannot be changed. It is created to prevent double-spending of a cryptocurrency.¹ In a traditional transaction, e-commerce relies “exclusively on financial institutions serving as trusted third parties to process electronic payment.”² Only money processed by an authorized institution such as a bank is trusted, in that the institution is aware of all transactions and guarantees the payee that the sender doesn’t double-spend it.³ Blockchain, by contrast, is decentralized without the need of a third institution, because it is based on proof-of-work rather than trust towards an entity.

On the blockchain, when a single transaction occurs, a network of computers verify the details, and once verified, the transaction will join numerous similar transactions to be a block.⁴ The proof-of-work is an algorithm used by the blockchain to confirm transactions and to add new blocks to the chain.⁵ A mathematical problem (i.e. proof-of-work) will be given for individuals to solve, the answer of which is called the hash. Once the problem is solved, the entire block can be added to the blockchain, and all the transactions go public. One block will contain all the information including the hash from all the previous blocks, forming a chain.

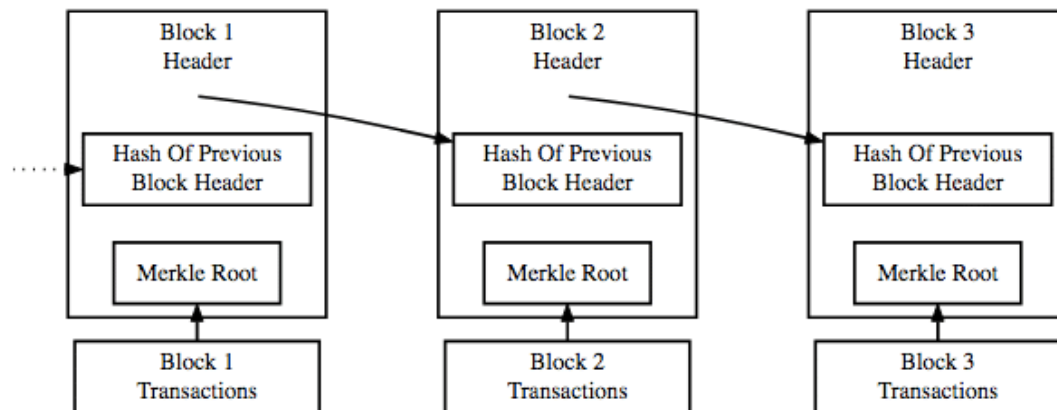


Figure 1 Simplified Bitcoin Block Chain, Source:[Blockgeeks](https://www.blockgeeks.com/)

The information stored on a certain block cannot be changed without redoing

the proof-of-work of all the blocks after it, which requires enormous CPU power and is

¹ Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (Bitcoin.org: 2008), <https://bitcoin.org/bitcoin.pdf>.

² Ibid

³ Ibid

⁴ Luke Fortney, “Blockchain Explained,” Investopedia, November 26, 2019,

<https://www.investopedia.com/terms/b/blockchain.asp>.

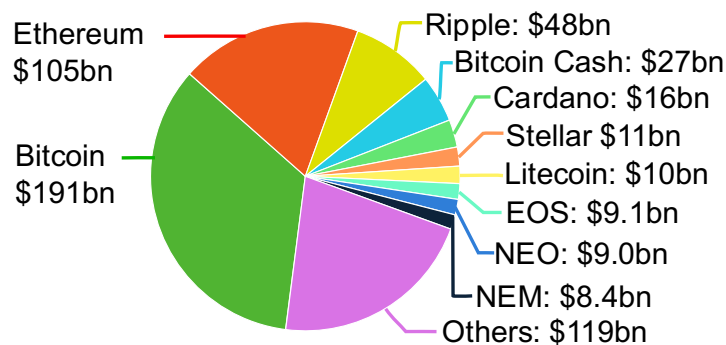
⁵ Andrew Tar, “Proof-of-Work, Explained,” *Cointelegraph*, January 17, 2019, <https://cointelegraph.com/explained/proof-of-work-explained>.



proved to be mathematically impossible, making the blockchain immutable.⁶

The blockchain is highly secure also because of the public and private key cryptography. Each user owns their public and private key, which are essentially large integer numbers.⁷ The sender sends the cryptocurrencies to the payee, whose address is derived from his/her public key, and the sender signs the transaction using his private key. It's very difficult to derive a private key from a public key so there is less risk of being hacked. The user, however, should keep their private key carefully since once it is lost, it is impossible to get it back.

Blockchain is often inappropriately synonymous with Bitcoin, given the fact that Nakamura Satoshi created the first public blockchain to record transactions of Bitcoin. Though the two things often go hand in hand, they are essentially different. Bitcoin is an electronic “cash” or asset because its value is determined by the supply and demand in the market, while the blockchain is the peer-to-peer network that supports it. Bitcoin can be substituted by many other forms of cryptocurrencies. In the past few years, various blockchain-based cryptocurrencies emerged, including Ethereum, Ripple, Bitcoin Cash derived from a fork of Bitcoin, and so on. Their market capitalization has grown over time.



8

Figure 2 Cryptocurrency Market Capitalizations as of 2018, Source: CoinMarketCap

As these cryptocurrencies emerge, blockchain technology is transforming, too. Ethereum blockchain, for instance, released in 2015, differentiates itself from Bitcoin blockchain by enabling people to not only transfer money (which can be achieved by the latter) but also to execute smart

contracts and make Decentralized applications (DApps) with its native programming language Solidity.⁹ It is a “decentralized programmable blockchain-based software platform” that can store and execute coded programming logic as if commands.¹⁰ On the Ethereum blockchain,

⁶ Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (Bitcoin.org: 2008), <https://bitcoin.org/bitcoin.pdf>.

⁷ WeTrustLeonD, “Why Do I Need a Public and Private Key on the Blockchain?,” *Medium, WeTrust Blog*, January 29, 2017, <https://blog.wetrust.io/why-do-i-need-a-public-and-private-key-on-the-blockchain-c2ea74a69e76>.

⁸ Mikael Häggström, *Market Capitalization of Cryptocurrencies*, January 27, 2018, Accessed

December 10, 2019, https://en.wikipedia.org/wiki/List_of_cryptocurrencies#/media/File:Market_capitalizations_of_cryptocurrencies.svg.

⁹ Harsh Agrawal, “How Is Ethereum Blockchain Different From Bitcoin's Blockchain?,” *CoinSutra*, September 6, 2019, <https://coinsutra.com/ethereum-blockchain-vs-bitcoins-blockchain/>.

¹⁰Ibid

individuals and organizations can do more than simply transfer cryptocurrencies between parties. Users can create smart contracts with Ethereum blockchain. Self-operating computer programs will automatically execute when specific conditions are met, “without any possibility of censorship, downtime, fraud, or third-party interference.”¹¹

Private blockchains have emerged as well. The difference between a private blockchain and a public blockchain is that permission is needed for an individual to participate in a private blockchain, which is not needed on public ones. The private blockchain is “an invitation-only network governed by a single entity.”¹² On its permissioned network, a private blockchain can restrict activities that some participants can carry, which creates an added layer of privacy.¹³ Large enterprises and governments are currently paving the way for the development of this kind of blockchain.¹⁴

The functions and the way the blockchain works vary slightly depend on what type of blockchain it is. Despite those differences, blockchains are by nature peer-to-peer, immutable, and highly secure. Due to those valuable characteristics, it can be applied to other fields beyond Bitcoin or cryptocurrencies, such as supply chains, contracts, accounting, voting, etc. The

auction industry, as a fork in the art industry, is no exception.

THE INTERSECTION

From ancient Rome to modern eras, from traditional houses to online, the auction industry has been constantly evolving thanks to technological and economic revolutions. As one of the most cutting-edge technologies, blockchain disrupts the art auction industry by altering the way that data is recorded, and the way art is sold and bought.

Data Security

Traditional auction houses look to blockchain as a solution for ensuring the security of collectors’ confidential information, as increasing cases emerge regarding the leak of confidential client information – even for giants such as JP Morgan Chase, and Home Depot.¹⁵ Specifically for auction houses, the transaction volume and amount of bidder data collected by institutions make them attractive for attackers. For instance, Heritage Auction reported more than 3,000 attacks occur on their computer system every day.¹⁶ The auctioneers are aware that sensitive information provided by bidders will be encrypted, but whether or not the information is encrypted properly remained questionable.¹⁷ A free online analysis lab rates Heritage Auction “A”, both Sotheby’s

¹¹ Ameer Rosic, “What Is Ethereum? [The Most Updated Step-by-Step-Guide!],” *Blockgeeks*, January 24, 2020, https://blockgeeks.com/guides/ethereum/#What_is_a_Ethereum_smart_contract.

¹² Nicola Heath, “What’s the Difference between a Private and Public Blockchain?,” *INTHEBLACK*, September 5, 2018, <https://www.intheblack.com/articles/2018/09/05/difference-between-private-public-blockchain>.

¹³ Ibid

¹⁴ Ibid

¹⁵ Daniel Grant, “As Auctions Go Digital, Hackers Set Their Sights On Buyers’ Data,” *Observer*, May 20, 2015, <https://observer.com/2015/05/as-auctions-go-digital-hackers-set-their-sights-on-buyers-data/>.

¹⁶ Ibid

¹⁷ Ibid

and Christie's as "B", and a handful of others as "F".¹⁸

Christie's was the first mover to embrace blockchain technology in their system, teaming up with a blockchain-secured art registry service company called Artory for the sale of the Barney A. Ebsworth collection of American

discussed before, the immutability and security provided by the blockchain can help rebuild trust for the increasingly risk-averse collector.²⁰

Figure 3 Auction Room, Christie's, 1808,
Source: [Internet Archive](#)



modernism in November 2018.¹⁹ On Artory, the collector can register their artwork onto the blockchain after the information is reviewed by experts. The artwork information is then made public for people to view, while allowing the collector to remain anonymous throughout the entire process. Even Artory doesn't have access to their identity and private information. As

Blockchain Marketplace

The blockchain provided by Artory serves purely as a secured ledger to register objects and to record information regarding artwork and sales data, instead of a marketplace for transactions. No cryptocurrencies are involved in this process. Traditional auction houses like

¹⁸ Ibid

¹⁹ Henri Neuendorf, "Christie's Will Become the First Major Auction House to Use Blockchain in a Sale," *artnet News*, October 12, 2018, <https://news.artnet.com/market/christies-artory-blockchain-pilot-1370788>.

²⁰ Thomas Rowlandson, *The Microcosm of London*, 1808, Accessed December 10, 2019, https://en.wikipedia.org/wiki/Christie%27s#/media/File:Microcosm_of_London_Plate_006_-_Auction_Room,_Christie's.jpg.



Figure 4. Artworks sold on R.A.R.E. Digital Art Market, Source: R.A.R.E Art

Christie's, do not plan to go beyond and utilize any cryptocurrency in their system. However, Many other online platforms are actively using cryptocurrencies on their blockchains, on which artworks are traded through direct sales and fractional ownership. On these blockchain marketplaces, the way art objects are bought and sold is changed, regardless if they are digital or traditional.

Digital art is a fast-growing medium, even if it is not fully integrated into the mainstream art world yet. The blockchain gives digital artists, who are marginalized in today's market, a chance to potentially connect with more customers while creating scarcity for their products. A problem often encountered by digital artists is that once their digital art is duplicated, the value drops down as their work can be replicated easily.²¹ On the blockchain marketplaces, artists introduce scarcity to each picture by limiting the number of copies available online. What makes the

blockchain superior is, again, the timestamp, proof-of-work, and its immutable record. The customer can trace the entire chain of transactions and ownership, with little chance of fraud. Examples include R.A.R.E Digital Art Market, where photographs, illustrations, animations and so on are sold-- the authenticity of which is tracked on the blockchain.²²

Fractional Ownership

The fractional ownership is another trend. The first auction that involved the tokenization of a multi-million-dollar artwork took place in September 2018. The *14 Small Electric Chairs Reversal Series* by Andy Warhol were sold on a start-up platform named Maecenas. 31.5% of the artwork was sold at a valuation of \$5,600,000 by 100 purchasers, valued at \$1.7 Billion before the transaction.²³ The owner pre-transaction, Eleesa Dadiani, still holds chief control over the artwork, but

²¹ Jason Bailey, "Blockchain Art 3.0 - How to Launch Your Own Blockchain Art Marketplace," *Artnome*, February 27, 2019, <https://www.artnome.com/news/2019/2/27/blockchain-art-30-how-to-launch-your-own-blockchain-art-marketplace>.

²² Screenshot by author, R.A.R.E Digital Art Market, Accessed 10 December <https://rareart.io/>.

²³ "Maecenas Successfully Tokenises First Multi-Million Dollar Artwork on the Blockchain," Maecenas, September 6, 2018, <https://blog.maecenas.co/blockchain-art-auction-andy-warhol/>.

offers digital certificates of ownership to successful bidders.²⁴

The benefits of fractions are straightforward in that people no longer must buy an entire work of art at a prohibitive price.²⁵ Breaking the ownership of artwork into pieces is similar to issuing shares. It enables people who cannot afford an entire painting, such as those of Warhol, Monet, etc. to purchase a small portion of art and trade it. As Maecenas advocated, they intend to democratize the fine art. Just like the stock market, it allows investors to further diversify their assets. It provides liquidity for investors as well, meaning that those assets can be converted into cash more quickly due to a relatively cheaper price.

As a side note, most platforms right now allow for trading with real U.S. dollars or existing cryptocurrencies such as Bitcoin or Ethereum, though some platforms are also considering creating their own tokens. Maecenas, for instance, created ART token, which is now equal to 3 cents in US dollars. As stated on their official website, the organization is still working hard to get ART tokens onto major exchanges.²⁶

BARRIERS AND CONCERNS

Despite the underlying benefits that the blockchain can bring to the auction industry, barriers and concerns still exist.

Simply uploading their artwork onto a blockchain doesn't mean that artists,

collectors, and auction houses can automatically gain a broader audience. Only 2,601 artworks are registered with Artory right now, and many of them remain unsigned, waiting for an expert to review the information and confirm it. As we introduced before, the blockchain is a public ledger where every participant records information. It is secure, but is meaningless if only a small group of people are participating, and if the expert fails to evaluate and input correct information on time.

If not combined with a significant number of buyers, the flexibility and liquidity advocated by online platforms will not be achievable by trading with cryptocurrencies and the blockchain. The trade volume shown on most bitcoin marketplaces is disappointing. Maecenas, the pioneer in this field, has only 2000 members, and after 1 year, no other artworks have been tokenized and traded on the platform.

It is also worth noting that even though there are a lot of similarities between the stock market and fine art tokenization, they are essentially different. The stock transaction is a two-way process. The company goes public and raises funds by selling shares. In return, they run their business to create value for their shareholders with daily operations, providing profit to the investors in the form of either an increase in stock price or dividends. Most of the time, the

²⁴ Ephrat Livni, "A New Cryptocurrency Art Auction Is Selling Shares in an Andy Warhol Painting," *Quartz*, June 20, 2018, <https://qz.com/1310093/a-new-cryptocurrency-art-auction-is-selling-shares-in-an-andy-warhol-painting/>.

²⁵ Jacqueline O'Neill, "What You Need To Know About Art Tokenization And Investment," Medium,

Blockchain Art Collective, May 22, 2018, <https://medium.com/blockchain-art-collective/what-you-need-to-know-about-art-tokenization-and-investment-13523d3b5f1d>.

²⁶ "Where Can You Buy ART Tokens?," Maecenas, January 7, 2019, <https://blog.maecenas.co/where-can-you-buy-art-tokens/>.

information and strategic steps taken by a publicly listed company are transparent, and shareholders own the voting right on matters of corporate policymaking, especially the election of the board.

There is much more ambiguity when it comes to a tokenized fine art. The owner of the work, defined as the artist or the person who owns the majority of the artwork, is not strictly held accountable for the variation of the value, and compared to a company, he/she typically has relatively fewer incentives to boost the price. Plus, the blockchain brings transparency, but it is specifically oriented to the previous ownership and transaction history associated with the work and tokens. It is doubtful whether the buyer can have access to decisions made by the owner or not. Questions include: who can decide to

from exhibitions? The issue becomes more complicated when the work is further fractionized (for instance, each person's ownership is roughly equivalent). Even Dadiani who sold the Warhol's silkscreen, doesn't yet know what she is going to do once the work is nearly-half sold.²⁷ This kind of situation doesn't happen in the stock market.

Compared to the S&P 500, the fine art segment is lucrative and seems to have a much higher compounded return as estimated by WSJ.²⁸ However, the market capitalization, the type of buyers and sellers involved in the market, as well as all the factors that affect the price of art are not comparable. It is deceptive when the numbers are transformed into percentages, and investors should keep those differences in mind. Also, the return is calculated based



*based on Wall Street Journal for 2018



*based on estimates for 2018

Figure 5. Screenshot from Maecenas Website, Source: Maecenas

exhibit the work in an exhibition? Are they going to vote? If so, through what platform? How will they allocate the profit earned

on the traditional fine art market, where most art is traded with U.S. dollars. Cryptocurrencies, nevertheless, are not

²⁷Ephrat Livni, "A New Cryptocurrency Art Auction Is Selling Shares in an Andy Warhol Painting," Quartz, June 20, 2018, <https://qz.com/1310093/a-new->

[cryptocurrency-art-auction-is-selling-shares-in-an-andy-warhol-painting/](https://www.maecenas.co/).

²⁸"What Are Asset Tokens?," Maecenas, accessed December 10, 2019, <https://www.maecenas.co/>.

currencies but assets. The volatility associated with tokens can potentially add more uncertainty to the investor's return.²⁹

Those kinds of concerns, in sum, are preventing many blockchain marketplaces from growing. It is understandable since this integration came up in recent years. The auction industry is in the early stage of transformation, and buyers and sellers are skeptical and might be somewhat reluctant towards the blockchain technology. Explicit regulations regarding ownership rights, channels of communication/voting, and so forth, must be written and published by online bitcoin-based auction houses promptly to close any loopholes.

SUMMARY

In conclusion, blockchain is a distributed ledger that records transactions in an immutable and irreversible way. The characteristics may vary slightly based on what type of blockchain it is, but overall, the blockchain is decentralized, highly secure, and cannot be corrupted. Overtime, public blockchain, where anyone can become a part of it, and private blockchain, where permission to become a node on the network is needed, have developed. In addition to transferring cryptocurrencies,

smart contracts can also be embedded with some certain types of blockchain such as the Ethereum blockchain.

Blockchain technology is impacting various industries, and fine art is no exception. Specifically, the integration of the blockchain and auctions, one branch in the art field, changes the way that the arts are bought and sold, and the way information is recorded. It helps digital artists create scarcity and prevents their work from reproduction by limiting the number of copies available, as well as by recording transaction history transparently. Fine arts are tokenized to be more affordable to general investors, and the personal information of collectors is highly secured with the private key.

Nevertheless, moving artwork onto the realm of blockchain does not guarantee higher sales volume and more active traders. Many bitcoin marketplaces for art are challenged by a lack of participants. The profitability of those kinds of exchanges is also questionable. Detailed regulations are needed to build people's trust. After all, though the concept is disruptive, the blockchain shouldn't be regarded as a universal solution to everything. Modification and accommodation are always needed.

²⁹ Screenshot by author, Maecenas, Accessed 10 December <https://www.maecenas.co/>.

BIBLIOGRAPHY

- Agrawal, Harsh. "How Is Ethereum Blockchain Different From Bitcoin's Blockchain?" *CoinSutra*, September 6, 2019. <https://coinsutra.com/ethereum-blockchain-vs-bitcoins-blockchain/>.
- Bailey, Jason. "Blockchain Art 3.0 - How to Launch Your Own Blockchain Art Marketplace." *Artnome*, February 27, 2019. <https://www.artnome.com/news/2019/2/27/blockchain-art-30-how-to-launch-your-own-blockchain-art-marketplace>.
- Fortney, Luke. "Blockchain Explained." Investopedia, November 26, 2019. <https://www.investopedia.com/terms/b/blockchain.asp>.
- Grant, Daniel. "As Auctions Go Digital, Hackers Set Their Sights On Buyers' Data." *Observer*, May 20, 2015. <https://observer.com/2015/05/as-auctions-go-digital-hackers-set-their-sights-on-buyers-data/>.
- Heath, Nicola. "What's the Difference between a Private and Public Blockchain?" *INTHEBLACK*, September 5, 2018. <https://www.intheblack.com/articles/2018/09/05/difference-between-private-public-blockchain>.
- Livni, Ephrat. "A New Cryptocurrency Art Auction Is Selling Shares in an Andy Warhol Painting." *Quartz*, June 20, 2018. <https://qz.com/1310093/a-new-cryptocurrency-art-auction-is-selling-shares-in-an-andy-warhol-painting/>.
- "Maecenas Successfully Tokenises First Multi-Million Dollar Artwork on the Blockchain." Maecenas, September 6, 2018. <https://blog.maecenas.co/blockchain-art-auction-andy-warhol/>.
- Nakamoto, Satoshi. *Bitcoin: A Peer-to-Peer Electronic Cash System*. Bitcoin.org: 2008. <https://bitcoin.org/bitcoin.pdf>
- Neuendorf, Henri. "Christie's Will Become the First Major Auction House to Use Blockchain in a Sale." *artnet News*, October 12, 2018. <https://news.artnet.com/market/christies-artory-blockchain-pilot-1370788>.
- O'Neill, Jacqueline. "What You Need To Know About Art Tokenization And Investment." Medium. *Blockchain Art Collective*, May 22, 2018. <https://medium.com/blockchain-art-collective/what-you-need-to-know-about-art-tokenization-and-investment-13523d3b5f1d>.
- Rosic, Ameer. "What Is Ethereum? [The Most Updated Step-by-Step-Guide!]." *Blockgeeks*, January 24, 2020. <https://blockgeeks.com/guides/ethereum/#What is a Ethereum smart contract>.
- Tar, Andrew. "Proof-of-Work, Explained." *Cointelegraph*, January 17, 2019. <https://cointelegraph.com/explained/proof-of-work-explained>.

OLD WINE IN A NEW BOTTLE: THE INTEGRATION OF THE BLOCKCHAIN AND AUCTIONS

WeTrustLeonD. "Why Do I Need a Public and Private Key on the Blockchain?" Medium. *WeTrust Blog*, January 29, 2017. <https://blog.wetrust.io/why-do-i-need-a-public-and-private-key-on-the-blockchain-c2ea74a69e76>.

"What Are Asset Tokens?" Maecenas. Accessed December 10, 2019. <https://www.maecenas.co/>.

"Where Can You Buy ART Tokens?" Maecenas, January 7, 2019. <https://blog.maecenas.co/where-can-you-buy-art-tokens/>.