A Very Brief Introduction to Non-Fungible Tokens (NFTs) for the GLAM Sector

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Executive Summary

During the height of the crypto craze of late 2021 into early 2022, American celebrities relentlessly touted cryptocurrency during Super Bowl television ads, urging viewers to buy now instead of missing out ("FOMO"). Now, digital currency assets like Bitcoin and Ethereum are substantially reduced in value from their prices during the 2022 Super Bowl. And in November 2022, the world witnessed the collapse and bankruptcy filing of FTX, one of the world's largest cryptocurrency exchanges that enabled customers to trade digital currencies for other digital currencies or traditional money (and vice versa). FTX's failure has led to investigations by the United States prosecutors at the Justice Department and regulators at the Securities and Exchange Commissions.[3]

We believe, however, that the broader public attention on cryptocurrency's price volatility obscures a broader discussion about the possible relevance and applicability of blockchain and non-fungible tokens (NFTs) to galleries, libraries, archives, and museums ("GLAM" or "GLAM sector"). The purpose of this paper is to begin this broader discussion.

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[3] Kalley Huang, Why Did FTX Collapse? Here's What to Know. The New York Times. Nov. 10, 2022, https://www.nytimes.com/2022/11/10/technology/ftx-binance-crypto-explained.html. See also Kevin Roose, Is This Crypto's Lehman Moment? The New York Times. Nov. 9, 2022, https://www.nytimes.com/2022/11/09/technology/cryptocurrency-binance-ftx.html

This paper serves several purposes. First, it is a follow up to a January 2022 Twitter Spaces conversation between North American GLAM sector leaders on the role of blockchain in the academy. Second, the paper serves as a centering document for a December 2022 talk at the Coalition for Networked Information (CNI) conference in Washington, DC, entitled "The LibNFT Project: Leveraging Blockchain-Based Digital Asset Technology to Sustainably Preserve Distinctive Collections and Archives." Several of the GLAM sector leaders that were involved with the January 2022 Twitter Spaces conversation are leading the CNI presentation. Third, this paper introduces the LibNFT project, an applied research project that asks and seeks to answer a fundamental question:

> Can blockchain technology generally—and NFTs specifically—facilitate the economically sustainable use, storage, long-term preservation and accessibility of a library's special collections and archives?

This paper provides an early snapshot of a quickly evolving technology and project. In addition to being presented between a January 2022 Twitter Spaces conversation and a December 2022 CNI presentation about the role of blockchain technology and the applicability of NFTs in and to the GLAM sector, we present this paper at a time when a lot of the "buzz" about "crypto" has subsided. Prices of major cryptocurrencies such as Bitcoin and Ether have plummeted from the lofty valuations they held in fall 2021, and now the cryptocurrency market is fully amidst what many financial news commentators call a "crypto winter."

In addition, we present this paper not long after the Ethereum blockchain, which is integral to what we call a "Group 2" conversation—both about blockchain technology generally and NFTs specifically—completed a significant software upgrade in September 2022 without any downtime. This software upgrade, called the Merge, resulted in the now former Ethereum blockchain combining with a parallel, now current network that had been running for almost two years. The upgrade had been under consideration for more than seven years.[4]

We will update this paper regularly as we move forward with further study and begin to process results from experiments with partners in the LibNFT project.

Clarifying the Terminology

If you are working in or studying the GLAM sector, it is easy to dismiss the relevance of this topic broadly known as "crypto." "Crypto" generally is shorthand for "cryptocurrency." Cryptocurrency is

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[4] https://www.bloomberg.com/news/articles/2022-09-15/ethereum-completes-long-awaited-energy-saving-merge-upgrade. The most significant change in the first iteration of the Ethereum blockchain to the second, current iteration of the Ethereum blockchain is that the current iteration now uses proof of stake methodology to validate transactions on the blockchain. The first iteration of the Ethereum blockchain used proof of work methodology to validate transactions. For a primer on the distinctions between proof of stake and proof of work, please see https://time.com/nextadvisor/investing/cryptocurrency/proof-of-work-vs-proof-of-stake/. For an introduction to the energy and climate implications in proof of work and proof of stake methodologies for mining cryptocurrencies, please see https://www.whitehouse.gov/ostp/news-updates/2022/09/08/fact-sheet-climate-and-energy-implications-of-crypto-assets-in-the-united-states/

any form of decentralized[5] currency that exists digitally or virtually and uses cryptography[6] to secure transactions.[7] Many forms of cryptocurrency are decentralized because they exist on decentralized networks that are based upon blockchain technology. In its simplest form, a blockchain is a communally maintained distributed ledger, or database, that reliably and immutably stores digital information.[8] Michael Meth, author of Blockchain in Libraries (2019), analogizes a blockchain to a family tree, with a hash tree or Merkle tree serving as an appropriate visual representation.[9]

These core concepts and the associated terminology are central to understanding the current phenomenon called "crypto." The practical problem is that people use "crypto" to describe not just digital currency but the totality of Web 3 digital assets. Hence, it is easy for people to talk and think only about money and riches when we speak about "crypto." For the purposes of this discussion, we will use "crypto" exclusively as a synonym for "cryptocurrency" but we will use the moniker "Web 3" [10] to describe the totality of digital asset technologies and solutions that include blockchain technology and digital tokens, including non-fungible tokens, or NFTs.[11]

Digital Assets & the Group 2 Conversation

By distinguishing "crypto" (i.e., digital currency) from Web 3 digital assets, we can have a broader conversation about the future of the Web and how the GLAM sector will be affected by it or can contribute to it. This broader conversation also allows us to think beyond simply money or financial return. Instead, we can think about how blockchains and protocols can foster governance and community into the online space. Ezra Klein, a columnist with The New York Times, recently discussed this divide in the preamble to his interview with Vitalik Buterin, the co-founder of the Ethereum blockchain.

Essentially, Klein theorizes that there are two main groups—and therefore two fundamentally different conversations—that are involved in the contemporary discourse about this new digital space, and that these two main groups are having fundamentally different conversations about Web 3. The "object" crowd, which we will refer to as Group 1, is interested in what crypto can create at the end of a chain of transactions. "They want their ape cartoon to be worth $5 million. They want their Bitcoin holdings to make them rich or to be really useful," wrote Klein. They want this financial tool to make them a lot of money or to help a lot of people. Success there is judged by what the final crypto object ultimately does." This is the group that video essayist Dan Olson critiques in

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[5] Decentralized as in doesn't go through a central bank. Compare "fiat currency"

[6] The cryptography is what makes the digital currency impossible to spend twice. https://www.investopedia.com/terms/c/cryptocurrency.asp

[7] https://www.kaspersky.com/resource-center/definitions/what-is-cryptocurrency

[8] https://www.nytimes.com/explain/2022/cryptocurrency-guide#what-is-a-blockchain

[9] Meth at 7. Explain what a Merkle tree is

[10] https://future.com/why-web3-matters/; https://www.nytimes.com/interactive/2022/03/18/technology/web3-definition-internet.html

[11] Mark Fenwick and Paulius Jurcys, "The Contested Meaning of Web3 & Why it Matters for (IP) Lawyers," https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4017790 (Downloaded Oct 29, 2022).

his viral YouTube January 2022 video "Line Goes Up — The Problem With NFTs,"[12] and whose antics and transactions HubSpot developer Molly White chronicles in her blog web3 is going just great.[13]

But the second group, which we will call Group 2, is interested in Web 3 for the object, outcome, or return, but instead for the processes that Web 3 can enable. Group 2 analyzes Web 3, according to Klein, for "the way it can decentralize decision making, or create new forms of transparency, or bind a whole community, or project, or even company to rules and protocols that can never be broken. … These are the people who are trying to make a future for [Web 3] that is more interesting than [] just some payment infrastructure operating in the background of the internet."[14]

The vitality of the Group 2 conversation exists beyond the market value of Bitcoin, the current "crypto winter,"[15] or whether you will miss out like Larry David, as one of those Super Bowl ads warned millions about.[16] This Group 2 conversation—the one about the possibilities for and with Web 3—is the conversation that GLAM sector leaders should be having and paying attention to, for it allows us to explore the possibilities of blockchain technology generally, and NFTs, without worrying about how much money we may have gained or lost.

NFTs

As a result, the Group 2 conversation allows us to talk about NFTs as the possible next evolution of the work—including curation, acquisition, conservation, preservation, digitization, exhibition,

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[12] https://youtu.be/YQ_xWvX1n9g. Ezra Klein interviewed Dan Olson for *The New York Times* in April 2022. https://www.nytimes.com/2022/04/05/podcasts/transcript-ezra-klein-interviews-dan-olson.html

[13] https://web3isgoinggreat.com. Given the precipitous fall of crypto valuations throughout 2022, the mainstream media increasingly has been interviewing White, who was one of the early skeptics of some of the large and seemingly unsustainable valuations that many digital currencies were trading at. These inflated valuations were a major factor leading to the torrent of "crypto" Super Bowl ads we chronicle in this essay. I (KMD) first became familiar with White's work, however, through an interview between her and Ethan Zuckerman, published in March 2022 by the Initiative for Digital Public Infrastructure at the University of Massachusetts Amherst https://publicinfrastructure.org/podcast/58-molly-white/

[14] https://www.nytimes.com/2022/09/30/podcasts/transcript-ezra-klein-interviews-vitalik-buterin.html

[15] "Crypto winter" refers to the rapid decrease in the price of many cryptocurrencies since fall 2021. Although Matt Damon's "Fortune Favors the Brave" television advertisement is associated with its extensive run during Super Bowl LVI in February 2022, the ad originally aired on October 28, 2021. On that day, Bitcoin, the most famous cryptocurrency, was trading at $60,608 apiece. Exactly one year later, 1 bitcoin cost $20,717, a decrease of 68 percent. https://theintercept.com/2022/10/26/matt-damon-crypto-commercial/

[16] "In the commercial, which was broadcast near the end of the first half of [the 2022 Super Bowl game], [Larry David] plays his skepticism for laughs by mocking humanity's great innovations. The wheel, he declares, is 'a miss.' He informs Thomas Edison that the light bulb 'stinks.' And in the scene that was supposedly responsible for Mr. David going hoarse, he tries to tear up the Declaration of Independence while hollering at the founding fathers about the ridiculousness of democracy. The commercial closes with Mr. David rejecting FTX, and then a warning: "Don't be like Larry. Don't miss out on the next big thing." https://www.nytimes.com/2022/02/13/business/media/larry-david-super-bowl-ftx-crypto.html

various levels of storage—that GLAM sector professionals have been doing for and with distinctive collections for ages. But first, we need to establish what an NFT is and why it matters in this space.

A non-fungible token, or NFT, is a distinctive, collectible digital asset[17] that is recorded on a blockchain. An NFT has a unique cryptographic code and metadata that makes each token non-reproducible, and which distinguishes one token from another. NFTs often serve as blockchain-based digital surrogates of items such as artwork, media assets such as video or sound recordings, or even items of information such as certificates of title.

Most NFTs are recorded on the Ethereum blockchain and paid for using the Ether digital currency. This is because the Ethereum blockchain is "the most important commercial highway in crypto," according to Bloomberg reporter Olga Kharif.[18] Part of the reason Ethereum can occupy this space is by design of its founders, who wanted to use blockchain technology to go beyond developing a currency-based exchange medium to developing a distributed computer network that serves as a foundation for building applications and digital infrastructure.[19] Buterin himself refers to Ethereum as "a blockchain with a built-in programming language"[20] and distinguishes Bitcoin from Ethereum as the difference between a calculator and a smartphone.[21]

The best way to understand what NFTs are, how they work, the relationship between Ethereum (and the Ether cryptocurrency) and NFTs, and their applicability to the GLAM sector, it is best to

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[17] NFTs are called "digital collectibles" in China specifically to downplay the "token" or financialization aspect, and to distance these assets from cryptocurrencies. "China Banned Crypto One Year Ago. What's Changed?" Bloomberg Crypto (podcast), Sept. 23, 2022, https://www.bloomberg.com/news/audio/2022-09-23/china-banned-crypto-one-year-ago-what-s-changed-podcast. Cryptocurrencies are banned in China https://www.nytimes.com/2021/09/24/business/china-cryptocurrency-bitcoin.html

[18] Bitcoin and ether are both digital currency assets, but their emphases differ. The Bitcoin blockchain, created in January 2009, was designed to facilitate development of the bitcoin digital currency as a store of value and ultimately as an alternative to government-issued fiat currencies. In contrast, the Ethereum blockchain, created in July 2015, issues the ether digital currency, and the associated blockchain is intended less as a currency alternative than as a platform for complex smart contracts and decentralized applications. Therefore, we talk about the Ethereum blockchain more than the Bitcoin blockchain when it comes to NFTs and the application of NFTs as part of sustainable special collections and archives. URL: https://www.investopedia.com/articles/investing/031416/bitcoin-vs-ethereum-driven-different-purposes.asp

[19] https://www.cnbc.com/2021/05/10/ethereum-what-is-it-and-how-is-it-different-to-bitcoin.html

[20] https://www.businessinsider.com/vitalik-buterin-created-ethereum-one-of-the-worlds-three-largest-cryptocurrencies-2019-1?r=US&IR=T

[21] In May 2021, Buterin, Ethereum's co-founder, analogized Bitcoin to a pocket calculator and Ethereum to a smartphone. "[T]hink of the difference between something like a pocket calculator and a smartphone, where a pocket calculator does one thing and it does one thing well, but really people want to do all these other things. And if you have a smartphone then on the smartphone you have a pocket calculator as an app. You have playing music as an app. You have a web browser as an app and pretty much everything else. So basically [Ethereum is distinct from Bitcoin in] taking that same kind of idea of increasing the power of the system by making it more general purpose and applying it to blockchains." https://www.cnbc.com/2021/05/10/ethereum-what-is-it-and-how-is-it-different-to-bitcoin.html

develop and mint[22] an NFT. On the Ethereum blockchain, NFTs are minted using the ERC-721 data standard.[23]

The full process of creating and minting an NFT is beyond the scope of this paper and is best understood by doing and experiencing firsthand. The LibNFT project [https://www.libnft.com/] that we are involved with is working with colleges and universities on creating, minting, and researching the impact of NFTs, using distinctive collections.

But No, Really: Why NFTs?

Given all the talk about bored apes, why should galleries, libraries, archives, and museums (GLAM) pay any attention at all to NFTs? There are several reasons. First, NFTs are collectible digital assets, and the GLAM sector long has been involved in accumulating, curating, and preserving collectible digital assets. In the world of curation, an NFT really is like just a different form of investment into the very thing we love as collectors and guardians of rare and unique material—just in digital form.

Second, NFTs can have brand value. Based upon their one-of-a-kind nature, NFTs can carry cultural cachet in at least two different ways. For one, the subject matter of an NFT can be unique enough that the token carries a certain level of prestige. Additionally, the entity that issues the NFT can be credible enough that the issuance of a token from that institution bestows distinction upon the issued token. Therefore, association with a reputable institution increases the value of the NFT.

Given these factors, why wouldn't the GLAM sector have an interest in NFTs and the development of this market? Who else will generate enough interest to aid in the preservation of said items—both the issued tokens AND the items that are being minted into tokens—with a sense of trust and integrity?

And by extension, why wouldn’t we expand our knowledge of digital assets and invest in the ones that represent real-world objects so that we can protect and preserve our existing collections? Right now, commercial entities dominate much of the first-mover advantage for GLAM sector NFT activity. For example, Ingram has announced plans to invest in Book.io, a company that makes e-books available on the blockchain where they can be sold as NFTs. And the famed auction house Christie’s launched Christie’s 3.0, a blockchain auction platform that is dedicated to selling NFT-based art. Dapper Labs collaborated with the National Basketball Association to develop the NBA

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[22] The process of placing an NFT on a blockchain is called “minting.” Said another way “Minting an NFT means converting digital data into crypto collections or digital assets recorded on the blockchain. The digital products or files will be stored in a distributed ledger or decentralized database and cannot be edited, modified, or deleted.” Nashville Film Institute, https://www.nfi.edu/what-is-minting-an-nft/

[23] URL: https://ethereum.org/en/developers/docs/standards/tokens/erc-721/

Top Shot marketplace,[24] which is a “a blockchain-based virtual trading card platform” that is built on top of Dapper’s Flow blockchain.[25]

But despite the commercial aspect of these projects, there are common threads that most curators will recognize:

(1) Selecting an appropriate collection or artifact for transformation into a digital surrogate or collectible,

(2) developing the collection or artifact into a digital surrogate or collectible,

(3) placing that surrogate or collectible inside a new format or technology,

(4) that is distributed to, exchanged with, or presented to individuals or entities other than the creator of the digital collectible,

(5) in the hope that the digital collectible has some value.

Most conversations about NFTs are Group 1 conversations that discuss “value” almost exclusively in terms of the amount of financial return or cultural or social cachet. Curators recognize, however, that “value” does not need to be synonymous with pecuniary value: value also could be “research value,” or “aesthetic value,” or “cultural value.” Once we separate “value” from strictly financial meanings, or substitute other types of value for financial value, then whole NFT concept seems quite like the kinds of activities we already do with distinctive collections: creating digital surrogates from analog artifacts; hosting and making those digital surrogates accessible through digital networks; providing value to others through digitization and accessibility. When framed in this way, the research into NFTs in the GLAM sector ultimately is a Group 2 conversation.[26]

This is where the LibNFT project comes into play.

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[24] https://nbatopshot.com/

[25] Randy Ginsburg, “The Impressive Rise and Untimely Fall of NBA Top Shot.” May 31, 2022; URL: https://nftnow.com/features/what-happened-to-nba-top-shot/; https://www.nba.com/news/nba-and-dapper-labs-to-launch-1st-ever-nft-auction-on-nba-top-shot; https://www.dapperlabs.com/newsroom/nba-and-dapper-labs-to-launch-first-ever-nft-auction-on-nba-top-shot-giving-fans-access-to-the-ultimate-all-star-vip-experience; https://flow.com/

[26] It would be foolish, however, for people engaging in a Group 2 conversation to think that the Group 1 folks won’t try to exploit financial returns in any space. Now that the “crypto winter” is here, Group 1 folks are seeking the next set of opportunities. At some point, they will find opportunities in the GLAM sector, just like they found opportunities in journal publishing. We should be mindful when the chief strategy officer of Coinbase, a company that operates a cryptocurrency exchange platform, says to Bloomberg “I do think what is going to generate outsize returns is capturing and creating trends. I do think identifying emerging cultural movements or communities early and investing in the financialization of those cultural movements is going to be a huge thematic trend. ... It's one that a lot of people aren't talking about, aren't looking at.” URL: https://www.bloomberg.com/news/videos/2022-10-01/after-the-crash-there-will-be-consequences-crypto-irl

The LibNFT Project

The LibNFT project [https://www.libnft.com/] seeks to extend the Group 2 conversation into the not-for-profit GLAM sector, consistent with GLAM values that focus on sustainable and equitable development, exchange, and knowledge sharing. We have begun this project by asking a fundamental question: can blockchain technology generally—and NFTs specifically—facilitate the economically sustainable use, storage, long-term preservation and accessibility of a library's special collections and archives?

The LibNFT partnership, which is comprised of active and practicing leaders in the GLAM sector, is actively seeking additional partners in higher education, museums, and galleries to engage in applied research to answer this question. Regardless of the outcome of this research, we believe that this space will develop quickly, with or without GLAM entities' involvement or participation, and that GLAM leaders ignore blockchain, digital assets, and the metaverse at their institutions' peril.[27]

Partners in the LibNFT project are[28]

- K. Matthew Dames, Edward H. Arnold Dean, Hesburgh Libraries and University of Notre Dame Press, University of Notre Dame and 61st President, Association of Research Libraries
- Meredith R. Evans, 74th President, Society of American Archives (2018-2020)
- Michael Meth, Dean, University Library, San José State University and author, *Blockchain in Libraries* (2019, ALA TechSource)
- Tony Zanders, CEO, Skilltype, Inc. and Inaugural Entrepreneur in Residence (2019–2021), Boston University Libraries

You may send inquiries about the LibNFT project to tony@libnft.com. More information is available online at https://www.libnft.com/.

[27] See note 25.

[28] Institutional affiliations are for identification only.