CODEX PROTOCOL

A cryptocurrency and decentralized registry for unique assets, starting with Art & Collectibles.

WHITEPAPER
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This white paper is subject to change from time to time.
01. Preface

It is my privilege to introduce the Codex Registry for Unique Assets (“Codex”) and the protocol that defines it. The white paper that follows will provide an overview of Codex Protocol and the problems it endeavors to solve. In the long-run, we foresee Codex benefiting many different categories of unique assets, from luxury goods to agricultural, industrial and commercial equipment, to emerging digital assets like in-game items. Initially, we are focused on the $2 trillion Art & Collectibles (“A&C”) asset class. As a preface, I will explain why we’ve started with A&C and why I believe Codex Protocol is of particular interest to the crypto-community.

First, A&C provides an experience for newly wealthy holders of crypto-assets; driving a classic car on a wide open road, appreciating the work of a master artist in your home, owning a rare crypto-kitty, or drinking your finest vintage wine on a special occasion. Codex will make it possible to purchase these experiences directly from existing auction houses with cryptocurrency.

Second, A&C is a financial asset into which cryptowealth should immediately diversify. While today cryptowealth is diversifying into ICOs, altcoins as an asset class are highly correlated with Bitcoin. A&C, in comparison, provides an uncorrelated, appreciating and private store of value. Indeed, high-net-worth individuals currently allocate an average of 6% of their portfolios to A&C as a financial product. It seems logical that cryptowealth will do the same.

Third and finally, A&C has a strong need for a decentralized registry, a long-touted application of the blockchain. Unlike every other asset class, no central title registry for A&C exists. To solve this problem, we have brought together a consortium from the A&C community that ensures Codex will be integrated into the systems of over 5,000 auction houses in over 50 countries, which makes its successful adoption as a standard highly likely. This presents a unique opportunity to prove the effectiveness of a blockchain-based asset registry to the public.

This is a fascinating market and the white paper that follows will expand on the above issues in depth. I appreciate your interest in Codex Protocol and look forward to developing Codex.

Sincerely,

Mark Lurie

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CEO, Codex Protocol
02. Introduction

Codex Protocol is a decentralized registry for unique assets backed by an industry consortium representing 5,000 auction houses. Codex is initially focused on the $2 trillion Art & Collectibles asset class (art, wine, jewelry, watches, collectible cars, etc.), where the need for a registry is greatest because no centralized title registry exists. For unique assets, provenance (the identity, chain of ownership, and other metadata about an item) is fundamental to value. Verifying this critical information is a constant challenge that creates costly friction in the ecosystem.

The Codex Protocol registry solves this problem by recording, verifying, and securely storing important information about each item. With this information, Codex users can easily access a variety of applications and services like asset-backed lending, insurance, fractional ownership, bidding, escrow and more. The first application lets you use cryptocurrency to buy over $6 Billion of merchandise from auction houses. Many other applications have already been announced including a bidding application, through which the first purchase was of a CryptoKitty for the highest price ever achieved.

With a widely adopted registry, we expect lower transaction costs and less fraud could grow annual transaction value by hundreds of billions of dollars and simplified financial products like lending and fractionalization could increase the value of the asset class by over $1 trillion. In doing so, it will benefit existing market stakeholders and intermediaries, not disrupt them.

The A&C industry is eager for a registry, and the consortium believes one is finally possible because it can be decentralized. Centralized efforts have failed in the past because collectors are unwilling to trust a central entity with information about their valuable possessions and intermediaries are unwilling to risk disintermediation. The advent of the blockchain enables a decentralized solution that stakeholders will accept.

Of course, a registry only works insofar as it is adopted as a standard. To that end, we have established a consortium of leading online marketplaces, software providers and auction houses with operations spanning over 50 countries who have agreed to support Codex. They support Codex as an open and decentralized protocol that anyone can integrate with. The consortium will help to accelerate the adoption of the registry and ease its path to acceptance as the standard.

Finally, we introduce a native token, CodexCoin (CODX). Codex uses a native token for several purposes. First, to access and pay fees to the registry to create, amend and transfer records. The token is further used to align incentives within the Codex ecosystem: First, the token enables rewards to validators like auction houses and appraisers who vouch for items in Codex. Second, it gives applications discounts for holding CodexCoin over a period of time, which ensures affordability and ensures applications will engage in governance. Third, it ensures enforcement of proper behavior by validators and applications by requiring them to stake. Finally, it provides a mechanism for the devolution of governance to end-users over time.

Soon after Codex is launched, we expect widespread utility and usage. As the A&C market passes through auction, the asset registry will increasingly become a standard on which further applications and financial products are built.

Together, we can help unlock the value of unique assets.
03. Art & Collectibles

Global UHNWI A&C Wealth 2016-2026
USD 1.6 trillion 2016 → USD 2.7 trillion 2026

3.1. Art & Collectibles Market
Codex Protocol initially focuses on the A&C market which includes art, fine wine, collectible cars, antiques, decorative arts, watches, jewelry, valuable coins, musical instruments, digital collectibles and more.

Art and collectibles provide an experience; driving a classic car on a wide open road, appreciating the work of a master artist in your home, owning a rare crypto-kitty, or drinking your finest vintage wine on a special occasion.

Art and Collectibles is also a financial product. It is a US$2 trillion asset class which is expected to grow to US$2.7 trillion in the next ten years\(^1\) with an estimated US$620 billion of annual transactions\(^2\).

3.2 Structure of A&C Market

The A&C ecosystem is a highly fragmented network of individuals and businesses involved in the production, dissemination, and consumption of A&C goods. The transaction market is comprised of several international alpha tier auction houses and dealers, a thick middle at the national and regional level trading in the $2,500 - $100,000 range, and an extremely long tail of those operating at local levels.

There are currently several methods of sale in the A&C market:

- **Private Sales**: Sales of anything purchased by one party from another at a negotiated price.\(^3\) For private sales, commissions are undisclosed and often unknowable since there are often many intermediaries party to the same transaction.

- **Live Auctions**: Sales of “lots” of items run by an in-person auctioneer who opens and closes bidding on each lot before moving onto the next. Most sales include hundreds or even thousands of items and are scheduled months in advance for a specific date and time to allow for marketing and promotion. Bidders can participate in-person, via telephone, or over the internet in real-time. For live auctions, commissions typically range between 20 and 30% of the hammer price.

- **Timed Auctions**: A sale of one or more items in which bids can be placed asynchronously until bidding ends at a specific scheduled time. Commissions on timed auctions typically range between 0 and 10% of the final selling price.

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\(^1\) Deloitte Art and Finance Report 2017.

\(^2\) Deloitte / Wealth-X.

\(^3\) The two parties can be two collectors, a collector and a professional dealer or gallery, two dealers, institutions, groups, etc.
3.3 Use of Technology in A&C Market

Discovery and purchase of A&C are facilitated by a number of white-label software providers who enable dealers, galleries and auction houses to maintain their e-commerce and auction websites and mobile apps, along with online marketplaces that aggregate and index items and vendors. Several of the best-known include LiveAuctioneers.com (live auction marketplace), eBay.com, 1stdibs.com (e-commerce marketplace), Invaluable.com (live auction marketplace), Lofty.com (live auction marketplace), AuctionMobility.com (white-label auction software).

An estimated 15% of annual A&C sales are purchased online, with projected growth to 30% in the next several years. Since Codex Protocol solves several deep-rooted problems in transacting A&C both online and offline, we believe its adoption will further accelerate the shift from offline to online commerce that we expect will drive a virtuous circle of demand for CodexCoin.
04. The Codex

A registry is critical to an efficiently functioning market because it allows actors in that market to quickly access, verify, and update information about assets. In the case of unique assets, this is even more important because the information and attributes about each asset can differ so much. In A&C, the absence of such a system of record holds the market back. It makes it hard to determine value, expensive to transact and hard to detect fraud because information can be lost, miscommunicated or maliciously duplicated. Codex creates an entry on the blockchain for each item where information about that item can be stored, creating a simple system of record that is easy to access. This will make it less expensive to transact and easier to insure, lend, ship and more. The use-cases are innumerable, and all of them depend on the “identity” of the piece itself.

4.1 The Importance of Item Identity

The identity of an item is important for several reasons. First, it is necessary to determine an item’s value, which is critical for most transactions and services. Second, it is necessary to provide ancillary services related to the item.

4.1.1 Provenance

In A&C, the provenance (the history of ownership of an item and associated documentation) accounts for almost the entire monetary value of an item because it is the most important indicator of authenticity.

To understand the importance of provenance, just look at authentic Picasso paintings, Chateau Margaux wine, and Rolex watches. They are all highly desirable and valuable, whereas fake paintings, wine, and watches are essentially worthless. Unfortunately, there are many impressive forgeries. For instance, the now infamous New York Knoedler Gallery was forced to close after the sales of a fake Mark Rothko painting for $8.3 million and fake Jackson Pollock painting for $17 million were uncovered. A 2016 Netflix documentary, Sour Grapes, tells the story of Rudy Kurniawan’s conviction for selling thousands of bottles of fake wine totaling over $35 million. In A&C, over $6 billion is lost annually due to fakes and forgeries. Some estimates suggest that up to 40% of items circulating may be compromised. The risk of fakes, forgeries, and bad title is the greatest risk to a collector which makes provenance the most important attribute of any A&C item.

The ideal provenance is a well-documented history of ownership in an unbroken chain of transmission since creation or at least since sold by a trusted intermediary, along with other important information like dates of restorations, liens, insurance status, etc. Unfortunately, provenance documentation can also be subject to forgery. The most prominent example of this is Wolfgang Beltracchi, infamous for multiple forgeries of original works, who went to great lengths to forge provenance documentation, including having his wife pose in photographs as a fictional great-aunt, and alleged prominent art collector.

Today, verifying provenance is an ad hoc and unreliable practice. This is because there is no central title registry for A&C to track ownership and possession like there is in the real estate market. But, the idea of a registry isn’t novel. Quite the opposite — the benefits of a title registry are obvious to almost everyone in the A&C market. However, neither collectors nor intermediaries will trust a centralized registry that could compromise their privacy or that of their clients. Fortunately, tracking and verifying ownership and possession history is a perfect application for blockchain technologies.

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6 i2M (2015).
4.1.2 Other Metadata

While provenance is critical to value, other information is critical to the provision of services that help unlock the value of a piece. For example, a shipper may need to provide shipping reports and access export licenses, an asset-backed lender may need to know that there are no other liens or claims on the item before extending a loan, or a buyer may need to know what artist royalties are encoded on the item. From condition reports to current possession to third-party appraisals to liens, many services rely on reading and writing information relating to an item’s identity. In most asset classes, the government provides a registry that fulfills this service. In A&C, none exists, which hinders the efficiency of the market.

4.2 The Codex Solution

The Codex Protocol is designed as an asset registry tailored for A&C objects. A Codex Record is designed to preserve all information about a piece, including the evidence of ownership and other metadata. Specifically, a Codex Record includes records of:

- The ownership and transmission history of the item on the blockchain since the Codex Record was instantiated.
- Hashes of metadata including documentation (e.g. photographs, past appraisals, receipts, restoration records, etc)\(^7\), information stored on the Record by third-party apps and services like liens or storage facility environmental controls, as well as opinions of validators who vouch for the item (explained below).

By tracking ownership and transmission in an immutable history on the blockchain, the Codex Record provides a way for everyone to verify ownership. In doing so, it is decentralized, anonymous and trustless, such that owners don’t have to identify themselves nor does any central authority need to know their identity. This enables enthusiastic adoption.

For illustration purposes, here is an example of an item’s ownership history:

\[\text{AH} = \text{Public sale at an Auction House} \]
\[O_1, O_2, O_2, O_3, O_4 = \text{Owners}\]

\(^7\) This and other information on the Codex Record may be stored elsewhere and a reference hashed into the smart contract.
The story of this item begins at the artist (O1) who sold the piece to a collector (O2). The collector later decided to consign the piece to an auction house (AH), perhaps Christie’s. A new owner (O3) purchased it from the auction house and flipped it to a collector (O4) who currently owns it.

Now, O4 is trying to sell the piece to a new buyer. Codex allows O4 to delegate view permissions to the prospective buyer to view the information attached to the Record. While the buyer cannot see the identity of owners who elect to remain private, the buyer can see when ownership transfers have taken place and the identity of owners who have elected to be public (in this case, Christie’s, but in other cases, it could be the artist). This gives the buyer peace of mind that they are buying an item with good provenance which supports the value of the item. The buyer is willing to pay as much as if they had purchased the item directly from Christie’s or the artist.

Of course, O4 and the buyer both need an incentive to pass along the Codex Record to ensure the registry stays in sync with reality. We’ll address this question below in section 4.5 (“Challenges”).

To preserve collector privacy, the off-chain metadata associated with each Codex Record is private by default. Whoever has ownership rights to the Record (either the current holder or anyone they delegate permissions to) can share this metadata with other users.

While it’s true that anyone can instantiate a Codex Record, most will likely be created by intermediaries such as auction houses and then passed on to buyers. Since many items pass through auction at some point in their lives, most items should eventually have corresponding Codex Records. The consortium has already contractually agreed to instantiate a Codex Record for the items they sell, which includes over 10 million items sold each year in tens of thousands of auctions with over 20 million bidders.

4.3 Validators & Rewards

Once an item is on Codex, its future ownership is immutably tracked. When items are first loaded onto Codex, any associated information needs to be verified. Codex Protocol relies on Validators to research and load this information or to verify it if loaded by end-users.

In the offline world, buyers rely on experts (“Validators”) to verify provenance, judge authenticity and resolve disagreements. These experts include auction houses specialists, dealers, gallerists and appraisers. They are paid for doing so either through...
commissions or fees. The consortium has years of experience working with experts to validate items. For example, one of the consortium members offered an Authenticity Guarantee based on feedback sourced from a network of hundreds of distributed experts which achieved industry-leading accuracy rates.

The Codex Protocol’s validation network relies on the same validators to ensure the integrity of the protocol. It incentivizes them through rewards. At first, the validators themselves and the rewards they receive for their activities will be decided on a discretionary basis. Over time, we anticipate rewards will be algorithmically distributed along with a reputation system that scores end-users who have expertise. (See sections on “The Codex Economy” and “Organization and Governance”)

As validators verify information, the provenance of the underlying asset is strengthened, which in turn helps to maximize its value.

4.4 The Application Layer

We expect most users will interact with Codex through applications built by app developers. A simple example is an application that allows users to interact with their Codex Records without knowledge of blockchain or cryptocurrency. More complex examples of applications will be built for insurance, bidding, appraisals, asset-backed lending, insurance, etc. Each application serves a different use-case for collectors or other industry actors, and each use-case provides another reason for users to preserve their Records. We (Codex Labs, Inc, which is described in the “Organization and Governance” section) are building two initial applications to encourage adoption, but Codex is decentralized and anyone can use it and build applications. Together, we call this group of use-cases and the applications that address them the Codex Ecosystem.
4.5 Challenges

There are several key challenges associated with a decentralized registry for A&C:

**Pre-existing items**
First, many A&C items are already in existence. Of course, items created in the past will only have an immutable history since their instantiation on the blockchain. That’s why auction houses are a great way to onboard existing items to the registry—as part of the auction process, auction houses already research the provenance, compile documentation (e.g., sales receipts or written appraisals), analyze the item’s physical attributes, and vouch for items with their reputation. This information will be loaded onto Codex and future owners will know which auction house instantiated that information. The best evidence of authenticity will thus be the reputation of the auction houses or dealers who previously owned and sold a given piece. We intend to reward users for vouching for items on the registry to further address this issue.

**Linking digital records to physical items**
Second, we are linking physical items to digital records. We are often asked how we prevent malicious owners from swapping out a real piece with a fake one that could then be transferred along with a Record that has good provenance. Fortunately, there are multiple physical tagging technologies which can solve this problem. These include RFID tags and synthetic DNA, among others. For example, one company provides an inexpensive aerosol canister that sprays industrial diamond dust on physical items, and the resulting 4-d crystalline pattern is invisible to the naked eye but scannable with an iPhone. Several companies and developers have already engaged in designing applications that will register this data in Codex.

It is also important to emphasize that even without physical tagging technology, the registry will be a massive improvement to the status quo. We don’t think the initial threshold for innovation needs to be perfection, but rather significant improvement. Today, provenance is recorded on paper and verbally, which is easy to copy and difficult to verify. With provably unique Records, the existence of a Record with good provenance makes it hard for a malicious actor to sell a forged replica because a prospective buyer could reverse search for the Record with superior provenance and quickly determine that the replica’s title is
compromised.\(^8\) The Art Loss register works similarly today, where stolen art (including Nazi art) is registered, preventing its resale.\(^9\) Finally, the value of a piece is in its provenance, so transferring a good title along with a replica would only serve to decrease the value of the authentic piece as much as it increases the value of the fake piece, leaving the seller no better off. Codex is designed to provide a significant improvement over the status quo, which is why the consortium is eager to adopt it.

**Ensuring the registry is in sync with physical items**

The most important mechanism that keeps the registry in sync with physical items is behavioral incentives. Buyers will likely demand a Codex Record to preserve resale value by being able to prove provenance. Another reason a buyer might demand it is to ensure the seller doesn’t intend to resell the proven record of ownership along with a duplicate piece to another buyer. Perhaps most importantly is so the buyer can easily access the applications and services available in the Codex Ecosystem that can unlock additional value from the asset. The larger the Codex ecosystem becomes, the more incentive there will be for buyers to demand Codex Records with their purchases.

Of course, the registry won’t be perfectly in sync. There will be plenty of occasions when a Codex Record is lost. That’s ok. When a Codex Record is lost, an owner can restart a new provenance by uploading information and rewarding a high-reputation validator (e.g. a well-known appraiser or auction house specialist) for verifying and attesting that the new title is an extension of the old, lost Record. Of course, this requires trusting the validator, but we expect that’s sufficient in 99% of cases).

**Widespread adoption**

Adoption is a challenge that many blockchain companies face and is not unique to Codex. However, people often question whether the A&C industry is more conservative towards adopting new technologies, so it’s important to call this out as a challenge here. To address this, we focus a significant amount of research & development time towards architecting solutions that make the technology more accessible to users that are unfamiliar with blockchain. Additionally, we’re planning on building out educational materials and community outreach to existing members of the A&C space.

The strongest evidence that this industry will adopt Codex is the adoption we’ve already secured. There is substantial interest from companies already in the A&C space today in integrating blockchain technology to their existing workflows. In the “Ecosystem & Adoption” section we outline a number of companies that we have already partnered with that are planning on building on top of Codex Protocol.

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\(^8\) Note that this does not compromise privacy beyond the status quo. Today, past auction sales are public and a comprehensive list of artists’ known works is typically compiled in a Catalogue Raisonné. It isn’t the existence of items that compromises privacy, but rather personal information about owners.

\(^9\) The Art Loss Register (http://www.artloss.com/en) is the world’s largest database of stolen art, enabling experts to “check the provenance of items before they buy.” Codex will provide a similar capability for authenticity and ownership.
4.6 Technical Overview

In this section, we discuss the high-level technical design of the protocol and the components that it is composed of. One point we’d like to make clear is that we currently have no plans to build our own blockchain. The initial implementation of the protocol will be built on the Ethereum blockchain. It is our point of view that Ethereum is the premier blockchain solution to build upon. Its consensus algorithm is battle-tested, and has a rich developer ecosystem that allows our community to build faster and more securely than what is possible on other blockchain platforms. Tools like MetaMask, web3js, and Truffle are all vital to Ethereum’s success and simply don’t exist at this time on other smart contract blockchains.

Although Ethereum receives a lot criticism for having scalability issues, this is mainly for apps that have high-volume but low-value transactions. Codex Protocol sits on the other end of that spectrum, where the transactions that take place on the protocol are low-volume but high-value. If you are transacting with a physical asset that is worth hundreds or thousands of dollars, paying slightly higher fees in gas is nominal. That being said, we are not ideological and will continue to evaluate the ecosystem as competing blockchains emerge and become relevant.

There are a few components to the protocol:

- The Codex Registry, which is the ERC-721 smart contract
- CodexCoin, the ERC-20 utility token which are used as fees for write operations in the registry
- The staking contract, where token holders can stake tokens to receive a discount on token fees
- The proxy contracts, from which the core contracts are accessed through

The ERC-721 Non-Fungible Token Standard, which is how we are modeling the asset registry, was recently moved from Draft to Final status. The standard outlines a mechanism to ensure that each entry in Codex is unique and has its ownership tracked individually. This is inherently different than cryptocurrencies where each token is interchangeable and tracked on the blockchain as a count rather than as an individual token. This is a widely publicized standard that many wallets and exchanges are planning to implement, meaning that entries in Codex will be usable by many other Ethereum ecosystem tools on day one.

To perform write operations within the registry (including the creation of Codex Records, updating them, adding records to them, and transferring them) all incur fees in the Codex utility token, CodexCoin.

Each of the core contracts will be accessed through DELEGATECALL in a corresponding proxy contract to ensure the core contracts can be upgraded in the event of an emergency, or for future functionality upgrades. The notion of upgradeable smart contracts is one that has been explored in depth by many organizations and it has become a standard practice in smart contract development. We chose to use the pattern of append-only storage: all future changes to the core contract must inherit the original contract. This restricts the number of sweeping changes that can be made, but also ensures easier maintainability of the code and a reduction in risk of critical bugs being introduced. Since the ability to make functional changes to the smart contract is a contentious one that can impact end users, it is required that all changes to the protocol have to be voted on by the current governing body.

Since the ability to make functional changes to the smart contract, including fee requirements, can impact end users, it is required that all changes to the protocol have to be voted on by the current governing body.

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https://github.com/ethereum/EIPs/blob/master/EIPS/eip-721.md
The implementation of each of these components is available on GitHub\(^1\) under an open-source license. The mechanics of the ecosystem is being tested on the Rinkeby test network in a public beta that is accessible via https://beta.codex-viewer.com. Additionally, the smart contracts that make up the protocol are being audited by Hosho\(^2\), one of the top blockchain security firms. Once the initial audit of the smart contracts is complete, we will hold a public bug bounty paid in ETH to members of the community that find any security issues that weren’t found during the security audit.

\(^1\)https://github.com/codex-protocol/contract.codex-registry
\(^2\)https://hosho.io/
05. Ecosystem & Adoption

The entire A&C market can benefit from a system of record, from auction houses and galleries to collectors and artists to insurers and shippers. When provenance is easily verifiable, it means it’s easier to transact and provide related services to end-users. That’s why major stakeholders are supporting Codex, why businesses will integrate with Codex and why application developers will create useful software for end-users. Already, many businesses have announced their support of Codex. These include online marketplace and software providers who will help populate the registry with unique assets from over 5,000 auction houses that sell over 10 million items per year worth over $6 Billion in value. They also include appraisal services, asset-backed lenders, fractional ownership and securitization firms, and bidding applications. These partners will build applications that do the technical work of integrating with Codex in the background while providing a seamless user-experience to end-users for specific use-cases. Collectively, we term these businesses “partners” or “app-developers”.

In this section, we will describe the personas in the ecosystem, the use-cases that can benefit each of them, the businesses who have already announced integrations, and the first two applications which are being created by Codex Labs, Inc.

5.1 Ecosystem Personas & Use-Cases

The following are several examples of industry personas, how they might benefit from Codex, and examples of applications that might be built by or for them.

**Auction Houses, Galleries, and Dealers:** Codex makes it easy to vet and consign inventory so that intermediaries can focus their time and efforts on works of true value. It can also help vendors protect themselves against dealing in inauthentic works or works used for money laundering and terrorism financing. Smart contracts can facilitate easier and more trustworthy sales by ensuring buyers pay and brokers receive payment. Most importantly, collectors will purchase more if services and leverage are easier to access.

**Collectors and Investors:** Codex empowers collectors and investors to purchase A&C with much greater confidence in the integrity of works. This will enable faster transactions, easier cross-border movement, and, over time, a reduction in the costs associated with owning A&C (e.g., insurance). Codex will provide infrastructure for the development of inventory and wealth management applications. Having an efficient asset registry will also enable alternative models such as fractional ownership for investors. Finally, Codex will allow collectors to easily find objects they desire, enabling them to trace the verifiable record of ownership, with the permission of those owners, from the last known sale (e.g. at auction) to the current owner.

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13 References to any party other than Codex Labs, Inc. and references to any product or service of any third party, are for illustrative purposes only. Such products and services are subject to applicable law in each jurisdiction and Codex Labs will not make available any products and services in any jurisdiction in contravention of applicable law, and may not make them available at all. Codex Labs, Inc. does not intend to offer any regulated product or service directly through the Codex Protocol.
Artists, their Estates and Foundations: Applications built on Codex could provide an efficient means of cataloguing and archiving work for artists which will deter the creation of fakes and forgeries and may prevent manipulation of an artist’s market. An artist or their estate would be able to build a catalogue raisonné on Codex. Applications built on Codex could also enable easier tracking of resale royalty payments which may be due to artists but frequently remain unpaid.

Asset-backed Lenders: Today, a large market exists in loans secured by A&C. Owners seek out these loans for many reasons. For example, if they are asset rich but liquidity constrained and need to fulfill a financial obligation, a loan secured by A&C property may be their only viable option. Codex will support art lending since it will allow lenders to be more confident that they can confirm valuations and authenticity. This is likely to mean that lenders will become increasingly comfortable offering more asset-backed loans with higher loan-to-value ratios. Codex could also enable liens to be added to Records giving lenders further comfort.

Insurers: A large market currently exists for insuring A&C, both from damage at home and in transit. A Codex-based application could enable owners to quickly and easily obtain quotes and purchase insurance on items they own, as well as update premiums based on changing prices of their holdings. Insurance inspection, administration and underwriting costs could be decreased by using Codex to track possession during transit, verify insurance valuations and administer claims.

Storage and Logistics: Art storage and logistics is a multi-billion dollar industry which still relies heavily on paper records and outdated systems. Applications could be built on Codex to allow the easy management of items for storage and logistics.

Appraisers: Codex could support an application that enables buyers to post bounties for appraisals of a Codex Record that appraisers can compete for by appraising the authenticity and value of the piece. Appraisers would build a reputation in the application for their appraisals.

Museums: A&C is often bequeathed to museums for immediate tax deductions. This can be complex and expensive to structure but could be made simple and accessible if template contracts were used with a multi-owner Record system on Codex.
5.2 Businesses Building Applications

Leading businesses have already announced and contractually agreed on integrations with Codex. In aggregate:

- **$6B of items** will be available for purchase directly with crypto.
- **Up to 10M Records** populated annually through partners.
- **6+ useful applications** that will help Record-holders unlock the value of their assets.

**LiveAuctioneers.com** is the leading online marketplace for auctions of art, antiques and collectibles. They have announced that their millions of bidders will be able to claim a pre-populated Codex Record with each purchase from their 5,000 auction houses across 47 countries that sell millions of items annually worth over $5 Billion. Already, they have integrated a title-escrow application (Biddable) that enables bidders to register, bid and buy at their auctions with cryptocurrency. This is especially important because auctions provide an on-ramp of goods onto Codex en masse.

“We are thrilled to be one of the first to partner with Codex and to bring Biddable to our users,” said Phil Michaelson, President of LiveAuctioneers.com. “LiveAuctioneers has continuously invested in providing our auction house partners with services and technology solutions, and Codex and Biddable are the most exciting we’ve seen. Codex and Biddable can securely and anonymously increase trust among buyers, sellers, and consignors, so we, our bidders, and our auction house partners eagerly await its launch.”

**AuctionMobility.com** is the leading provider of white-label, mobile-first bidding software to elite auctioneers. Auction Mobility facilitates the sale of over $1 billion of unique items annually from over 15 countries. They have announced that any auction houses using their software will have Codex integration built in, so that auction houses can provide Records to their bidders and use a title-escrow application (Biddable) that enables bidders to register, bid and buy with cryptocurrency. This is especially important because auctions provide an on-ramp of goods onto Codex en masse.

**Maecenas** is a blockchain project that fractionalizes and securitizes artwork so it can be traded with ERC-20 tokens. They have announced an integration with Codex to create Records for their works and offer the ability to fractionalize selective works of Record-holders.

**Dust** uses inexpensive diamond dust to imprint a crystalline fingerprint on physical items that is invisible to the naked eye but can be scanned with an iPhone to verifiably link physical items with digital records like Codex Records. Users will be able to log the dust identifier onto their Record.

With **The Clarion List** Codex Record holders can expect to get quotes from reviewed service providers easily and effortlessly.
Luxury Asset Capital offers a one-click quote for an asset-backed loan.

Valuemystuff allows customers to request a virtual appraisal from the leading network of experts with prior experience at institutions like Sotheby's and Christie's.

Feral Horses allows you to acquire and trade shares of contemporary artworks.

Codex Labs, Inc.

Codex Labs, Inc. is a USA company (for-profit) that provides enterprise consulting services and tools to those integrating with and using Codex Protocol. The business model for Codex Labs, Inc is similar to that of other companies that have sponsored open-source projects, like Red Hat and Linux. It has already released two tools, the Codex Viewer and Biddable. Codex Viewer provides an easy web interface so that end-users can create, manage and modify their Records with no technical knowledge (see section 6 for a detailed explanation and screenshots). Biddable is a title-escrow and payment application that integrates into auction software and enables holders of cryptocurrency to register, bid and buy at auctions (see section 6 for a detailed explanation). Codex Labs, Inc plans to donate the profits from these activities to the community fund. Initially, 100% of these profits will be donated, decreasing over time no faster than the same rate at which the company’s tokens are unlocked. See section 8 on organization and governance for more information about Codex Labs, Inc.
6. Live Applications

6.1. Codex Viewer

Codex Viewer allows individual users to view and interact with Codex.

To make interacting with Codex easy for end-users, Codex Labs, Inc has built the Codex Viewer. Codex Viewer is a dapp which is intended as a user interface to create, modify and view Records. If the user owns the Record, s/he can take actions such as transferring it, uploading additional documentation, etc.

It can also be used by buyers to view information. Each Record-holder may decide privacy and visibility for their Records, because the data itself can be stored off-chain by one or many providers or a distributed file system like IPFS. For example, a private collector may hide all information about a piece or share it only with trusted counterparties, whereas an auction house might list in their online catalog the Record addresses of all items in an upcoming auction.

A beta version of Codex Viewer is live today interfacing with our smart contracts on the Rinkeby testnet. You can visit the viewer at https://beta.codex-viewer.com today on a desktop computer with the MetaMask plugin to preview the software.
6.2. Biddable

Biddable enables cryptoholders to purchase A&C instantly, privately and easily.

A critical problem in the auction industry is the phenomenon of bidders who bid and win, but never pay (“Non-performing bidder” or “NPB”). A unique item can have only one winner, so NPBs directly result in loss of sales and auction revenue. NPBs plague auction houses, costing billions of dollars each year. Biddable is a dapp intended to drive adoption of the Codex Protocol by solving this critical problem.

Currently, many auction houses try to reduce the number of NPBs by requiring bidders to register for auctions in advance, disclose their identities, financial ability to pay with bank statements, and even wire funds into pre-auction escrow. These disclosure requirements are burdensome, compromise privacy, and deter many bidders. Moreover, many bidders don’t want to disclose information regarding their wealth that may inform shill bidding, which is when a dishonest auctioneer or seller submits false bids to drive up the winning price. While illegal, most buyers believe that shill bidding is widespread in the industry. Indeed, research indicates a “price premium of between 16% and 44% can be achieved by shill bidding.”

This conflict between bidders’ demands for both privacy and convenience and sellers’ demands for identification and disclosure creates an impasse that lowers auction participation and revenue. While exact figures are confidential, the magnitude is large and data from the Consortium indicates that over one million bidders are excluded from participating in auctions each year. In particular, bidders from Asia are excluded from US auctions, primarily because they cannot provide disclosure documentation that is sufficiently translatable or verifiable by auction houses. This is particularly problematic for cryptoholders because auction houses will not consider balances in crypto-wallets.

Our solution is Biddable, a dapp intended to provide an instant and private alternative to the status quo registration and approval process. Biddable is a deposit-escrow system wherein cryptocurrency deposits are escrowed from the buyer and the seller. This enables bidders to

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prove their intention to pay while maintaining privacy\textsuperscript{15} and keeps sellers acting appropriately as well.

This dapp will not be a standalone consumer-facing application, but rather will be embedded in existing auction house bidding software. Initially, this will include LiveAuctioneers.com and the applications developed by AuctionMobility.com.

With Biddable, the bidder’s initial deposit will be in a major and highly liquid cryptocurrency like Ether (CodexCoin will also be accepted). Sellers will leave their stake in CodexCoin, and the maximum amount the auction houses can require as a deposit will be directly proportional to how much CodexCoin they stake. This will incentivize auction houses to set the lowest possible deposit requirement that will deter non-performing bidders rather than the maximum possible deposit that will help inform shill bidding. It will also prevent abusive behavior like offering items to test the market and then pulling them prior to sale.

If a bidder does not win anything, each party’s escrow will be released back. In the case of a winning bid, the escrow is locked until the bidder pays for their items, either in cryptocurrency with Biddable, or as normal in fiat. Winning bidders that did not register via Biddable can still use it to pay for their winnings using cryptocurrency. Biddable plans to charge a transaction fee, payable in CodexCoin.\textsuperscript{16} As an aside, we intend to donate the majority of these fees to the Community Fund for the foreseeable future to ensure alignment with the community.

If an auction house is unable to get payment from a bidder within a reasonable interval, they may declare them an NPB. In this case, we plan for the seller’s stake to be returned in full and the bidder’s deposit to be indefinitely locked. We orphan the deposit rather than transfer it to the seller so that there is no incentive for sellers to falsely declare NPBs.

For example, an auction house auctions a $10,000 item and stakes $500 of CodexCoin so that any bidder who leaves a $500 deposit is instantly approved. If the buyer wins and settles, Biddable earns a 1% fee of $100 (payable in CodexCoin) and the Record is transferred to the buyer.

In the view of the consortium, Biddable will have a major impact on the market. In addition to enabling the expansion of East-West trade, auctioneers have indicated that they may give a discount of as much as 5% to Biddable bidders because they leave deposits - yet another compelling reason for prospective bidders to adopt CodexCoin.\textsuperscript{17}

\textsuperscript{15} Technically, it may be possible for an auction house to trace a wallet address to a specific individual. However, this is very difficult and is unlikely in the context of a real-time auction where a deposit can be made from any existing or newly created wallet address at the last minute.

\textsuperscript{16} Biddable intends to charge this transaction fee in exchange for providing the decentralized smart escrow contract software. Biddable is not party to the transaction itself, is not in the flow of funds, and cannot adjust the smart escrow contracts once funds have been deposited, although it may occasionally update new versions of the smart contract software to auction houses for future auctions.

\textsuperscript{17} Consortium Survey Results
07. The Codex Economic Model

7.1 Design Overview

We are introducing Codex with a new ERC-20 utility token called CodexCoin (CODX). While the section below discusses how we intend the CodexCoin economy to behave, the field of token economics (colloquially known as “tokenomics”) is young and we expect that new techniques and best practices will emerge in the coming months that may result in changes to this model.

Furthermore, we do not profess to know with certainty how ecosystem participants will respond to the incentives we have designed. Thus, we focus on design principles and consider our specific design proposal as an illustration of how they might be applied. For example, we believe that initially interacting with the protocol should be easy. Those using the protocol heavily should have a say in governance and have an incentive to preserve the integrity of the network. Value-adding behaviors should be rewarded and malicious behavior deterred through economic penalties.

What CodexCoin is:

● The token is used to access the protocol. Users, or applications on their behalf, will pay fees in the form of CodexCoin to create, update, and transfer Codex Records. These fees will be used to provide rewards.

Incentive levers:

● *Discounts*: Users who maintain a stake of CodexCoin will receive discounts on protocol fees to ensure affordability for applications and engagement with governance.

● *Rewards*: Entities that provide value to the protocol and its ecosystem of applications will be rewarded with tokens. Examples including validators verifying provenance, artists uploading their work, and apps providing services for users. All rewards will be vested over time to ensure alignment.

● *Penalties*: Application providers and validators whom the protocol depends on should stake to deter bad behaviour.

● *Governance*: Those who hold tokens for a longer period of time should influence the evolution of the protocol itself.

In the remainder of this section, we will explore each of these levers and their expected outcomes in depth.

7.2 Utility of CodexCoin

Modifying Codex Records requires fees payable in CodexCoin. This is analogous to gas in Ethereum. It’s also similar to the 0x protocol where makers and takers pay fees in ZRX (the 0x token) to relayers to exchange tokens. Operations to read data are completely free, but operations to create, update, and transfer Codex Records have an associated fee depending on the type of modification. For example, adding a lien on a registered item may cost more than a transfer of title operation. Fees will be used to replenish a community pool that is used for rewards (discussed further below).

We do not intend that these fees should be burdensome for any one individual. Rather, they will be relevant for stakeholders who use the protocol in volume for commercial use, like app developers and auction houses.

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18Warren, Will. “Governance in 0x protocol”. https://blog.0xproject.com/governance-in-0x-protocol-86779ae5809e
In most cases, we anticipate applications to charge fees to end-users in the form of fiat or ETH for usability, while invisibly converting to CodexCoin to pay for protocol fees. Meanwhile, technically savvy users are more than welcome to interact directly with the protocol.

### 7.3 Discounts

Stakeholders will receive discounts on registry fees based on the size of their stake and the amount of time the stake has been active.

Token holders will not receive these benefits for simply holding tokens: staking is an explicit operation that requires token holders to deposit their CodexCoin stake into a smart contract. Additionally, it allows application owners to provide another layer of incentives to their users for staking to the application's contract. Stakes can be withdrawn at any time, but the longer a stake is held the greater the discounts.

In other words, the price ($P$) to make modifications will be inversely proportional to the average amount of CodexCoin held over a certain time period $H(t)$. $P$ and $H(t)$ may differ for various modification types to encourage usage and network effects.

This discount and staking mechanism has several desired outcomes. First, it ensures that those who use the protocol most will have affordable rates. Second, it incentivizes commercial users to evangelize the protocol to their users, advocate it as a standard, and engage in governance. Third, it gives applications an incentive to transition their users into CodexCoin holders as users become comfortable so that the application can save on conversion fees and token purchases. Finally, it gives the most frequent users an elevated say in the governance of the Codex Protocol.

### 7.4 Rewards

Those who create value for the network should be rewarded for doing so. In particular, validators and application developers.

Validators create value by contributing and verifying provenance information. They include appraisers, auction houses and their specialists, dealers, gallerists and creators/artists (see section 5). Examples of behaviors we'll reward include creating new Records, providing well-researched historical provenance, and attesting to Records created by end-users. Initially, Validators will be whitelisted and rewards will be distributed on a discretionary basis (see section 8 on governance).

Application developers who increase adoption or provide special value to the network should also be rewarded. For example, we intend to reward application developers in proportion to the downstream modification activity on Records (e.g., number of wallet addresses modifying) they created in the past, which is a proxy for actual usage of Records by end-users. These rewards will also initially be distributed on a discretionary basis.
Over time, we intend for rewards will be algorithmically distributed. The consortium will guide this algorithm along with the help of reputation applications built by developers. Examples of reputation applications will soon be posted on the Codex Protocol blog.

Whenever tokens are rewarded, they will be subject to vesting such that recipients have a continually refreshing incentive to maintain the network by evangelizing Codex to their clients.

7.5 Penalties

Those who participate in the network must behave appropriately. To deter inappropriate behavior, participants may be required to stake CodexCoin for various purposes.

For example, validators may be required to stake CodexCoin that can be penalized if they spam the network or are deemed by other validators to be contributing false information intentionally. Similarly, application developers may be required to stake CodexCoin that can be penalized if they don’t adhere to privacy and data portability policies of the protocol.

Since we want to minimize frictions to joining the network, we plan that rewards will be used to preload staking contracts for validators and application developers with locked-up CodexCoin who have just joined the network.

7.6 Governance

Although early governance of the protocol will be at the discretion of the consortium and Codex Labs, Inc, we believe in creating an open community that governs a decentralized system. To that end, we plan to put the entire governance structure in the hands of token holders and contributors to the network through an on-chain voting scheme in the future. The staking mechanisms in the aforementioned sections will thus provide one important basis for the protocol’s most involved actors to influence the protocol itself. Just as for discounts and penalties, we intend to apply the principle that both the magnitude and the duration of the stake are important in weighing the influence of the stake on governance. In addition to the stake, we also intend to consider contributions and other behaviors on the network in the voting mechanics.

7.7 Example in Practice: Biddable

The CodexCoin economy results from the interaction of applications and the underlying Codex Protocol. For illustration purposes, we’ll explain how Biddable works with the Codex Protocol.

As a reminder, Biddable is an app built by Codex Labs, Inc that integrates directly with auction houses to enable bidders to participate and purchase in auctions using cryptocurrency. At settlement, users will also be issued a Codex Record for any items won. Biddable’s costs will include the fees to create and modify Records on Codex.

Biddable is a profit-maximizing entity, so we expect it will do three important things:

1. Stake CodexCoin itself to reduce its registry fees.
2. Enhance usability by allowing buyers to use other cryptocurrencies (e.g. bitcoin, ether, fiat), which Biddable can convert to CodexCoin behind the scenes.
3. Incentivize users to acquire, use and stake CodexCoin themselves over time to avoid conversion fees.
This produces an important desired outcome, which is to incentivize dapps to encourage their users to use CodexCoin and experiment with staking mechanisms while providing a simple user experience. We like this outcome because it aligns incentives within the ecosystem and encourages adoption. As a reminder, Codex Labs intends to donate profits to the Community Fund, per section 8.1 (“Organization and Governance: Codex Labs, Inc”) to ensure alignment with the community.

As 3rd party applications are developed, they will face and respond to the same incentives. The result is an application economy which is constantly incentivized to promote the network, thus creating network effects.
8. Organization & Governance

8.1 Codex Labs, Inc.

Codex Labs, Inc. is a USA company (for-profit) that has developed the Codex Protocol code and is issuing CodexCoin. Once the tokens are issued, Codex Labs, Inc intends to provide enterprise consulting services and tools to those integrating with and using Codex Protocol. The business model for Codex Labs, Inc is similar to that of other companies that have sponsored open-source projects, like Red Hat and Linux. Codex Labs, Inc plans to donate the profits from these activities to the community fund. Initially, 100% of these profits will be donated, decreasing over time no faster than the rate at which the company’s tokens are unlocked.

8.2 The Consortium

Building a protocol that becomes an industry standard requires the support of large stakeholders and needs to accommodate the needs of diverse stakeholders. Building a committed consortium is the best way to accomplish this. Members of the consortium all agree to its mission, which includes:

- Develop and continually improve Codex.
- Support, sponsor and build impactful applications.
- Expand the consortium.
- Educate the A&C ecosystem about cryptocurrency and blockchain.
- Educate the crypto-community about the importance and opportunities of the A&C asset class.

8.3 Consortium Members

The consortium currently includes auction-related online marketplaces and software providers that facilitate the sale of several billions of dollars of A&C from over 5,000 auctioneers.

The members of the consortium currently include:

- LiveAuctioneers.com, the leading online marketplace for auctions of art, antiques, and collectibles, enabling over 4,000 auctioneers in 47 countries to host their auctions and connect with millions of bidders. LiveAuctioneers facilitates the sale of over $5 billion and millions of unique items annually.

- AuctionMobility.com, the leading provider of white-label, mobile-first bidding software to elite auctioneers, facilitating the sale of over $1 billion of unique items annually from over 15 countries.

Over the next several months, we expect the Consortium to continue to grow as more stakeholders join. We encourage and welcome any stakeholders in the A&C ecosystem to participate by supporting the Codex Protocol’s vision and using and building applications on top of it. Examples include significant collectors, auctioneers, dealers, museums, and other organizations vetted by the existing members. Conversations are underway and new members will be listed on CodexProtocol.com as they join.
8.4 Governance

The consortium is committed to robust community governance in the long-term and will work with experts in the governance of token economies to that end. The code itself is open-source and anyone can contribute to improvements.

In the short term, the consortium will ensure that changes to the protocol are aligned with its mission. The consortium’s power comes from its influence in the A&C market. If the consortium dislikes changes, its members can simply fork the protocol and their broad user base would likely go with them. Thus, we expect developers, including ourselves at Codex Labs, Inc, to defer to them as the protocol evolves.

Over time, we aspire to a formal community governance system, which we believe will result in a more robust and lasting ecosystem that best represents the goals and needs of every stakeholder. We also believe it will provide a foundation that will enable the protocol to be malleable over time in response to innovation and market maturity. We expect the governance system to be based on both stake and behaviors on the network, with limits to constrain any individual from exercising majority control. The CodexCoin token will be critical in enabling this decentralization of governance as a measure of a stake for voting.

8.5 Community Fund

A portion of the tokens will be reserved in a Community Fund. These will be used for rewards to validators and discretionary grants to new application developers, consortium members, early adopters, marketing campaigns, and other supporters of the ecosystem. For example, if an established online marketplace joins the consortium, they may receive a grant to align their interest with the ecosystem and to fund development of further Codex applications. It will also be used to fund community and educational initiatives that help to create a developer ecosystem and educate the A&C market.

The Community Fund will be subject to an anticipated lock-up that unlocks monthly at an annualized rate of ~25% per year.

The decision-making process for allocating the community fund will be coordinated by Codex Labs with input from the Consortium. Over time, as with overall governance of Codex, we intend for governance to be decentralized to the community.

Rewards to validators will initially be discretionary with the intent of a gradual transition to an algorithmic, reputation-system based approach.

Grants to application developers will also initially be discretionary based on criteria including:

- Expertise in the A&C space
- The proposed use of Codex
- Ability to drive adoption of Codex among new users
- Likely benefits to the Codex ecosystem

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19 All incentives and rewards referred to in this White Paper will only be distributed on a fee-for-service and calculated and distributed on a one-to-one basis. No mutualised and/or passive profit, income or other returns are intended or advertised by this project.
Similarly, educational initiatives will be funded to encourage adoption of the protocol within A&C and familiarity with A&C within the blockchain community. Examples include symposia and conferences, educational programs for A&C stakeholders on blockchain and for app developers on A&C, and more.  

8.5 Creating a Developer Ecosystem

Applications are especially important to the success of Codex, so we want to summarize the activities we believe will foster a robust developer ecosystem, even if redundant. These include:

1. App developer grants from the Community Fund.
2. Incubation & Acceleration programs, such as hackathons
3. Active community development, both online in social channels and offline in meetups.
4. Tools and support for developers, including SDKs and other packages.
5. Education for app developers about the market and the protocol.

The consortium anticipates directing the community fund resources to encourage a robust ecosystem of applications and services supported by developers.
09. Roadmap

9.1 Potential Value Creation
We expect that Codex Records will become an authoritative source of information about A&C items, which would create well-over $1 trillion in value for the ecosystem. For example, if owners could more easily lever their assets 50%, the asset class could grow by half. If cryptoholders invested as much in A&C as high-net-worth investors do, it would create hundreds of billions in new transactions. If it were easier to verify items and thus transact, commissions could be cut dramatically, creating hundreds of billions in value.

In the long-run, the Codex Protocol could be applied to other categories of unique assets. These include Luxury Goods (designer goods and fashion), Equipment (agricultural, industrial, commercial), vehicles (luxury autos, boats, and airplanes), digital assets (collectibles and in-game assets), real estate (agricultural, commercial and residential), and more. Once a robust ecosystem of applications is developed on top of an asset registry, the potential value created is immense.

9.2 Initial Adoption Strategy
We are launching Codex Protocol at the same time as its first application, Biddable, because the app is intended to drive adoption of the protocol. The reason we think the auction market is the best approach is that most items eventually circulate through the secondary auction market. Biddable is expected to solve a critical need in the auction market, which is why the leading software and technology vendors to the auction market have committed to integrating it. This means both Biddable and Codex Protocol will be immediately available to over 5,000 auction houses for their use.

Our launch strategy has three phases, which we will pursue in parallel despite describing them sequentially.

Phase 1: Pre-launch (Completed)
- Technical development of Codex Protocol, Biddable and Codex Viewer.
- Integration of Biddable into the software and technology providers within the consortium.
- Recruitment and engagement of third-party application developers.

Phase 2: Launch (July 2018)
- Marketing campaign to educate and build awareness among the following bidder personas:
  - Cryptoholders regarding the benefits of diversifying into art and collectibles and the ease of doing so through Biddable
  - Fiat bidders, especially those in Asia, who are currently excluded from western auctions but can access them using cryptocurrencies and Biddable
  - Existing fiat bidders, both online and offline, who will be able to bid more easily at auctions using Biddable.
- Release of Codex Protocol on mainnet and distribution of CodexCoin

Phase 3: Post-launch
Codex Protocol will pursue its mission as previously described (“Organization and Governance”). We expect that in each vertical, the consortium will first expand, then new applications will be developed (often with community fund sponsorship), after which
marketing will likely occur to end-users for the new use-case. Marketing will include working closely with core partners in the art ecosystem, industry bodies and international organisations as well as art business events and conferences.

We are confident in our strategy and ability to execute the pre-launch and launch plan because the team has extensive experience launching products and increasing adoption in the art and collectibles market, including:

- Managing multi-million dollar marketing budgets in the A&C market.
- Managing inside sales teams soliciting auction houses and galleries through “predictable revenue” strategies.
- Launching and promoting scaled software products for the art and collectibles space.

Based on this experience, we are confident that our sales and marketing strategy and campaigns will be effective in driving adoption of the protocol at launch. Proceeds from the ICO will be used as follows: 25% taxes; 15% sales and business development; 20% marketing; 25% engineering and 15% operational expenses.

9.3 Timeline to Launch

Codex Protocol anticipates launching in 2018. The roadmap is currently as follows.

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10. Team & Advisors

The Codex Protocol will have been designed and developed by a team of operators and advisors experienced in building technology products, venture capital, finance, software development and the A&C market. This ensures that the protocol meets the needs of the A&C market and is built to last.

10.1 Founders

**Chief Executive Officer, Co-founder**

Mark Lurie previously founded Lofty.com, an expert-reviewed A&C marketplace that was acquired in 2016. Prior to Lofty, he worked in venture capital as an investor at FJLabs and Bessemer Venture Partners, early investors in many leading businesses like Pinterest, Yelp, Linkedin, and Twilio. Mark has an MBA from Harvard Business School and a BA from Harvard College in Economics.

**Chief Operating Officer, Co-founder**

Jess Houlgrave previously worked at OPTrust, a large Canadian pension fund, where she executed several billion dollars of European private equity transactions as part of the Private Markets Group. Prior to OpTrust, she worked at Credit Suisse in the investment banking group where she was involved in IPOs that raised over USD$1 Billion. Jess has an M.A. in Art Business from Sotheby’s Institute of Art, where she wrote her thesis on the applications of blockchain technology in the art ecosystem and later worked in Sotheby’s bidding department. Jess also has an M.A. in Economics and Management from the University of Oxford.

**Chief Technology Officer, Co-founder**

John Forrest previously worked at Microsoft as a Senior Software Engineer in the Identity division, which provides secure authentication for the billions of customers that use Microsoft products every day. Past projects include leading the convergence of Microsoft’s consumer and enterprise identity systems and integrating Microsoft’s consumer identity systems into the Xbox One. John was consistently rated in the top percentiles of his organization at Microsoft and has a BS in Computer Science from Southern Methodist University where he graduated summa cum laude with a minor in Mathematics. At SMU he was awarded the Departmental Award for Computer Science and holds multiple undergraduate research awards for his work in data-stream clustering.
10.2 Advisors

Crypto and Technology

**Joey Krug**, Co-Chief Investment Officer at Pantera Capital & Cofounder of Augur. Joey brings deep technical expertise and guidance to Codex. He has been at the forefront of developing best practices in the token ecosystem and a strong voice in the developer community. At Pantera, Joey is the Co-Chief Investment Officer of a $100 million ICO fund. At Augur, Joey developed the technology for prediction markets with the vision of creating a decentralized financial system. Joey is also an advisor to Numerai, Urbit, 0x, Bloom, and doc.ai.

**Nader Al-Naji**, Cofounder & CEO of Basecoin. Nader has a background in finance and software engineering. He has worked at DE Shaw & Co in equities high-frequency trading, as well as at Google as a software engineer in the Search and Ads teams. He graduated summa cum laude in Computer Science from Princeton.

**Dr. Abe Othman** has a PhD in Computer Science from Carnegie Mellon and is a visiting scholar at the Wharton School of the University of Pennsylvania. He earned his BS in Applied Math from Harvard. He was named to the Forbes 30 under 30 list and is an advisor to Augur and Stox.

Arts & Collectibles

**Brook Hazelton**, Christie’s President of the Americas. Brook Hazelton is the current President of the Americas for Christie’s, one of the two largest auction houses in the world with over $7 Billion in annual sales. Previously, he was the CEO of Phillips de Pury & Co, one of the largest A&C auction houses in the world (www.phillips.com), where he grew sales 400% in four years. Before Phillips, Brook worked in Private Equity at the Carlyle Group and Goldman Sachs. He is a graduate of Harvard Business School (MBA) and Princeton University (BA). [https://www.linkedin.com/in/brook-hazelton-421a1/](https://www.linkedin.com/in/brook-hazelton-421a1/)

**Sarah Shinn Pratt** is an experienced auctioneer and appraiser. For 13 years, she was an auctioneer at Sotheby’s as well as the Director of Appraisals for the Americas. She has appeared on multiple seasons of the Antiques Roadshow and, after Sotheby’s, ran an art & collectibles dealer and advisory firm with her husband. Sarah has an MBA from UCLA and a BA in Economics & Philosophy from Mount Holyoke College, Phi Beta Kappa.
Consumer Internet

**Fabrice Grinda** is among the world’s leading internet entrepreneurs and investors. He has over $300m in exits and 300+ angel investments. Currently, he is the founder of FJLabs.com, an early stage angel fund. Previously, he was the cofounder and CEO of OLX, one of the largest websites in the world with over 200 million monthly unique visitors, operations in 40 countries, and more than 1,200 employees. OLX is the largest classified site in India, Brazil, Pakistan, and many other emerging markets. Before OLX, Fabrice was co-founder and CEO of Zingy, which he grew to $200 million in sales in four years and exited. He worked at McKinsey and graduated Summa Cum Laude from Princeton in Economics.

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10.3 Announced Backers & Investors

**Bessemer Venture Partners** (BVP.com) is a leading venture capital firm with $4.5 Billion under management and a track record that includes over 121 IPOs. Recent companies include Pinterest, Blue Apron, Snapdeal, Twilio, Shopify, Box, Linkedin, Yelp, and Twitch.

**FJLabs** (fjlabs.com) is an angel investment firm specializing in online marketplaces and global companies, with over 300 investments across 20 companies including Alibaba, Betterment, Letgo, Palantir, Uber, Viajanet, and more.

**Pantera Capital** (panteracapital.com) is an investment firm focused exclusively on ventures, tokens, and projects related to blockchain tech, digital currency, and crypto assets. As the first U.S. Bitcoin investment firm, Pantera is the leading blockchain investment firm and one of the largest institutional owners of cryptocurrencies.
10.4 Advised By

A cryptocurrency and protocol for unique assets.