CryptoKitties: Collectible and Breedable Cats Empowered by Blockchain Technology

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Abstract

As blockchain technology continues to dominate headlines, cryptocurrencies—especially their valuations, and potential to disrupt the financial industry—are of increasing interest. However, the average consumer doesn't understand what a cryptocurrency is or why it matters, let alone how the technology behind it works.

As a result, the public perception of blockchain application is increasingly narrow-minded and short-sighted. Likewise, the technology's potential and long-term implications remain esoteric and largely ignored.

CryptoKitties will make blockchain technology accessible to the average consumer through four main tactics:

- Gamifying features that leverage blockchain's unique applications
- An approachable, consumer-facing brand based on a genuine passion for blockchain technology
- An open platform inclusive to users of all levels of technical knowledge
- A sustainable revenue-based model (as opposed to an ICO)

On a more technical level, we plan to innovate within the blockchain space through practical experimentation and application of digital scarcity, digital collectibles, and non-fungible tokens.

By normalizing the practical application of smart contracts and cryptocurrency transactions, we will empower everyday consumers with a basic fluency in distributed ledger technology. Likewise, by showcasing a practical use for blockchain technology outside of the financial industry, we hope to broaden the public's understanding of the technology and its potential application. Note that this whitepaper is provided for informational purposes only, and does not and will not create any legally binding obligation on the authors or on any third party. For specific legal terms governing the use of the CryptoKitties app, please view the Terms of Use here: https://www.cryptokitties.co/terms-of-use.

1. Motivation

In developing CryptoKitties, we were motivated by blockchain's public perception and how the following issues are potentially detrimental to the technology's potential:

1. The public's understanding of blockchain technology is limited and interest is typically tied to the headline-grabbing cryptocurrency valuations
2. ICOs are a powerful funding tool, but abuses with the model and a lack of practical use cases are sowing mistrust in the technology they're supposed to empower

These two issues contribute to a larger issue: a shortage of meaningful innovation with blockchain technology. To that end, our product aims to not only address these broad issues, but it aims to innovate within the space by practically exploring:

3. Digital scarcity, digital collectibles, and non-fungible tokens.

1.1 Public perception of blockchain technology

Distributed ledger technology has the potential to be the information age's biggest revolution since the Internet. Its potential applications are varied and its implications reach across numerous industries. However, the general concept of blockchain technology, especially in the mind of the mass consumer, is esoteric.

Existing blockchain projects typically limit their audiences to early investors or a relatively small group of people with highly specialized knowledge or interests. Even then, most of these projects are either concepts or works in progress: their practical product remains nebulous.

1.2 Practical and sustainable application of blockchain technology

Initial Coin Offerings (ICOs) have proven themselves a viable funding model for blockchain projects. However, while this model intends to open up funding to investors outside of the venture capitalist sphere of influence, it can create obstacles for other audiences. What's more concerning are the ICOs conducted in bad faith. These token sales amount to little more than scams, creating mistrust in the model, projects, and technology associated with them.

Because of the headline-grabbing focus of cryptocurrency valuations and the potential disruption to the financial industry, innovations in blockchain technology have been relatively stymied, instead focusing on the "low-hanging fruit" that is a cryptocurrency-adjacent application. Likewise, the "cryptocurrency," as a concept often goes over the head of the average consumer; they don't understand the implications of blockchain technology beyond simple trading and investment. While it's understandable that new developments will follow public interest to some degree, it may limit blockchain innovation in both the short and long term.

1.3 Meaningful innovation of blockchain technology via digital scarcity

Finally, an area of substantial experimentation that continues to go "unsolved" is the concept of digital scarcity and digital collectibles.

Digital goods have seen real-world valuation, from World of Warcraft's gold farmers to the Steam platform's online marketplace (where users can buy and sell in-game items across their PC's video game collection). However, these niche instances are limited to video games and lack any security or protections. There have been numerous examples of hacking, cheating, or developers influencing the ecosystem and larger economy.

Digital collectibles hold immense potential, but they haven't proven successful for three main reasons:

Central Issuing Authority

When digital collectibles are created and issued, and the most rare or popular collectibles are identified, there is nothing stopping the creator from simply creating more. When this happens, it diminishes the value of the original collectibles, potentially making them worthless.

Provider Dependency

The existence of a digital collectible is dependent upon the existence of the issuing authority. If a digital collectible is created and said creator ceases to exist, your digital collectibles also cease to exist.

Lack of Function

Physical collectibles are popular because of their intended purpose. Art is a great example: people collect it, it can be worth a lot of money, and it serves a purpose by hanging on the wall as a thing of beauty.

Current digital collectibles don't serve a purpose and don't have a function. This is evidenced by the initial interest shown in digital collectibles such as Cryptopunks, but that interest waned quickly. We believe this was, in part, due to their lack of functionality.

The only reason our previous examples have not been susceptible to these issues is because of their large user base, their central authority in the form of a large developer beholden to its large user base, and the "function" of these collectibles via their respective videogame application. The size, scope, and long-term pedigree of these platforms can alleviate fears associated with provider dependency, but it doesn't solve it.

Because these problems exist, people aren't willing to invest in digital collectibles, outside of these niche examples. If digital collectibles held their value the same way a physical collectible would, this problem is eliminated and an entirely new world of collecting would come to life.

2. The Product

CryptoKitties are digital, collectible cats built on the Ethereum blockchain. They can be bought and sold using ether, and bred to create new cats with exciting traits and varying levels of cuteness.

At launch, 50,000 "Gen 0" cats (colloquially referred to as "Clock Cats") will be stored in a smart contract on the Ethereum blockchain. These Clock Cats will be distributed automatically via smart contract at a rate of one cat every 15 minutes. Each cat will be sold by auction.

CryptoKitties are unique in appearance, with a distinct visual appearance (phenotype) determined by its immutable genes (genotype) which are stored in the smart contract.

By allowing the cats to breed, they aren't just a digital collectible. CryptoKitties is an exciting, self-sustaining community where users can create new collectibles and trade them on the ethereum blockchain.

Two CryptoKitties can breed to produce a new cat that is the genetic combination of its parents. Anticipating the outcome is exciting and the possibilities for new and rare genetic makeups of a CryptoKitty are endless. In each breeding pair, one cat acts as the sire and will have a recovery period before it can breed again. The second cat incubates the kitten, during which time it cannot engage in another pairing. There is no limit to the number of times a CryptoKitty can breed, but the recovery and gestational period increases the more they mate.

2.1 Education through gamification

CryptoKitties' key game mechanics are tied to actions associated with cryptocurrencies and smart contracts. In doing so, previously esoteric concepts are normalized and users are empowered with a basic fluency in the technology.

Because blockchain is an emerging technology, there are more obstacles to user onboarding than we consider ideal. At launch, a user will require a MetaMask wallet with ether in it. However, we plan to explore alternatives to MetaMask as a login solution, as well as and shortcuts for converting traditional currencies into ether. For now, we've set up straightforward guides to make the process as easy as possible.

2.2 Pawsitive perception and broad appeal

The CryptoKitties brand is incredibly approachable to consumers. By using colourful palettes, cute cat puns, and cat humour, the brand stands out in a space that is typically dominated by lacklustre, business-to-business branding. Outside of a few specific experiments, few blockchain projects have marketed themselves beyond high-value investors or crypto experts.

The CryptoKitties marketing plan also leverages influencers in various communities (e.g. celebrity cats, tech authorities, etc.) to design custom art for a litter of "Fancy Cats," which are CryptoKitties with custom art. This is yet another opportunity to broaden our audience and

introduce new users to CryptoKitties. It also creates long-term content marketing touchpoints associated with each Fancy Cat collaboration, release, and discovery.

2.3 Proven mechanics and practical testing

A major challenge associated with smart contracts is their immutable nature. The same concepts that empower trustless transactions and security make a smart contract flaw outright deadly. While a traditional software project can iterate or fix core issues, a blockchain project cannot edit its smart contract once it launches.

To this end, the economy and revenue model that we are exploring cannot be artificially influenced, for good or ill. With that in mind, it was crucial that we thoroughly test and explore our product's mechanics.

It's also worth noting that we believe that proof of concept is necessary to ensure trust in both a project and the technology behind it. We limited our "build in public" approach until we had a minimum viable product (in this case, an alpha build) to showcase to initial users.

We tested the concept and initial mechanics in a live, three-day alpha test at ETHWaterloo, the world's largest Ethereum hackathon. This alpha helped us foster our initial community and product advocates. It also provided insight into how to best utilize our game's core mechanics.

(Our team also won the ETHWaterloo Hackathon with Rufflet, a mixpanel application for smart contracts.)

A month later, we deployed our initial "beta" smart contract to Axiom Zen, our parent company. Unfortunately, there was a fatal flaw in the contract, so we terminated it.

We then launched our smart contract to an early access closed beta. This version passed with flying colours and catapulted CryptoKitties to the third most active Ethereum project on the network within three hours of the closed beta launch. Minor tweaks to breeding prices ensured a stable launch the following week.

2.4 A sustainable revenue model

Instead of pursuing an ICO, CryptoKitties operates on a sustainable revenue model. We receive a small percentage (3.75%) of each transaction conducted on its marketplace.

Like any other user on the CryptoKitties platform, we also receive the revenue from our cat sales. However, these cat sales are limited to the 50,000 "Clock Cats" that are released every 15 minutes via the CryptoKitties smart contract.

A Clock Cat's price is determined by the average price of the last five CryptoKitty sales, plus 50%. They are sold by a descending clock auction and their actual valuation will be determined by the marketplace's ecosystem.

2.5 Innovation via implicit mechanics

CryptoKitties provides a practical use case for digital scarcity and digital collectibles by pioneering ERC-721, a non-fungible token protocol.

https://github.com/ethereum/EIPs/issues/721

2.5.1 Non-Fungible Tokens

In general, tokens on the blockchain are fungible. The value of every token is the same and, similar to cash, it doesn't matter what token you receive. Because of this, blockchains track counts of tokens instead of the specific tokens themselves. This works well for things like stocks or currencies, but because CryptoKitties are genetically unique and breedable, we needed to create a non-fungible token environment.

To do this, we pioneered the ERC-721 protocol for non-fungible tokens, the standard for transactions and ownership of non-fungible assets on the blockchain. Using this protocol, CryptoKitties provides both an interface to browse unique items and robust smart contracts to conduct transactions (breeding) once both parties agree.

2.5.2 Descending Clock Auctions

While creating CryptoKitties, we needed to find a way to auction non-fungible tokens. Because each CryptoKitty is genetically unique, the current process for selling tokens on the blockchain fails because the value of each token could be different. Each token must have its own bespoke auction, like in an auction on a platform such as eBay.

Since CryptoKitties runs on the Ethereum blockchain, the typical English auction (where a suggested opening bid is made and buyers can increase their offer as time goes on) doesn't work either. The Ethereum blockchain requires each transaction placed on the network to pay gas fees, so users would be required to pay simply to place a bid. This is a poor user experience, so we needed to find a way to reduce the number of on-chain transactions.

To mitigate this, we created a descending clock auction. Sellers choose a high opening bid, a minimum closing bid, and a timeframe for which they'd like their auction to run. Buyers are able to choose their purchase price along that spectrum by purchasing when the price aligns with their perceived value of the CryptoKitty being sold – as long as someone else doesn't buy it before them. Buyers pay gas when they complete a purchase and sellers pay gas to initiate an auction.

The same process is used for breeding. CryptoKitty owners may place their cats available for sire by selecting a maximum opening bid for siring, a minimum closing bid, and timeframe for the auction. Owners who want to breed their cats may do so by choosing a sire and paying the current descending clock auction bid associated with the sire they want to breed with.

Conclusion: The Future is Meow

Our team believes in the potential of blockchain technology, but we're frustrated by the state and direction of its public perception.

We genuinely believe that education, an accessible user experience, and practical application are the missing factors for broader adoption. We strive to communicate this belief with CryptoKitties, Rufflet (our winning project at the ETHWaterloo Hackathon), and any any future blockchain projects our team works on.

We still see numerous opportunities to innovate with blockchain technology. With CryptoKitties, we're exploring digital scarcity, an exciting but underexplored concept that blockchain empowers.

CryptoKitties is the world's first game built on the Ethereum blockchain. It makes the blockchain approachable for the everyday consumer and brings us but a small step closer to widespread adoption of cryptocurrencies and blockchain technologies.

In our cheekily-titled "catifesto," we state that we didn't want to change the future, but rather, we wanted to have fun with it. That's not entirely true - we genuinely believe the power of fun and games can shape blockchain's future for the better.

We can't be sure that CryptoKitties will be a runaway success, a flash in the pan, or a blip on blockchain's biography. Like all things related to blockchain, the future is in flux.

But we do believe in a few things:

- We believe in blockchain's potential
- We believe in this product
- We believe in our team
- We believe in our community

Onwards and upwards,
The CryptoKitties Team