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# Cryptomarkets Gamified: What Can We Learn by Playing *CryptoKitties*?

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## ABSTRACT

This paper presents an analysis of *CryptoKitties* (Axiom Zen 2017) as an educational tool for blockchain adoption. The focus is placed on the official agenda of the game, presented in its white paper (“White Pa-Purr”) and the user guide. I compare statements of the game's developers to the actual practice of playing *CryptoKitties* for a year. Although gamification of blockchain technologies may have been successful on a broader level of service marketing, the game itself does not make cryptocurrency-based services more accessible to the audience previously unfamiliar with blockchain. However, I conclude that it can launch a longer independent exploration of crypto markets, a potentially transformative experience for the player.

## Keywords

blockchain, cryptocurrencies, cryptocurrency studies, crypto games, *CryptoKitties*, educational games, serious games, money games, Ethereum

## INTRODUCTION

*CryptoKitties* is the second blockchain-based game in existence<sup>1</sup> and the first ‘crypto game’ that became well known to the wide audience. It gained popularity in November 2017 and remained one of the most played cryptocurrency-based games in 2017-2019, dropping out from the top ten of the most ambitious similar projects in terms of market volume in 2020 (OpenSea). Overall, the game attracted nearly 90,000 players from November 2017 to November 2019 (KittyHelper 2019). It had almost 7,000 active players at its peak in December 2017 (DappRadar 2019).

The genre of the game can be described as a collectible pet breeding simulator. General rules and practices of *CryptoKitties* are similar to many popular casual games such as *Neopets* (1999) and *Ovipets* (2011). According to the official FAQ, to start the game, the player needs to purchase several digital ‘kitties’ and try to breed them. There is a certain, although very small, probability of a mutation in their blockchain-based ‘genes’. In such a case, the resulting ‘kitties’ will acquire the value large enough to sell them for profit. After trying this, a neophyte player can study various attributes of tokens and join the community on Discord to learn even more. The rest of the game is mostly free play with tokens, which encompasses their trade on dedicated marketplaces for the cryptocurrency Ether.

The game did not have a complete user guide at the beginning, and figuring out its rules was a part of the participatory experience in the first year of its existence. As a common practice in cryptocurrency-based projects, the basic principles of the game were

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outlined in a public white paper (*CryptoKitties* White Pa-Purr 2017). Since then, developers were gradually presenting other aspects of the game system in their blog, or players themselves decoded and described those (Stephens 2017).

All ‘kitties’ are unique. A specific part of their code - a 256-bit integer value - is stored in the smart contract and visualized in their appearance as a set of specific attributes (*CryptoKitties* White Pa-Purr 2017; see also Stephens 2017, as one of the first public attempts to decipher the code). These attributes can be inherited in a randomized manner by the ‘kitty’ from any of its two parents. All game data is open data, and computationally literate players can analyze the game code and build custom solutions such as, for instance, trading bots. In 2018-2019, with the help of the player community, a complete guide was compiled and published on the website of the game, and another website, [www.kittyhelper.co](http://www.kittyhelper.co), which initially collected game statistics, became the official third party guide (KittyHelper 2019). Players often refer to KittyHelpers’s statistics as the main authority when arguments about value arise.

During my own participation in 2017-2019, I discovered that, even with that much information on how to play the game and a friendly and dedicated game community, casual players encounter significant barriers when they enter the game. In this paper, I suggest that free exploration was the truly educational experience in the game; still, learning took place outside of the game system and the game world. As I will show below, the game itself does not provide enough information about cryptocurrencies and blockchain.

## **CRYPTOKITTIES AS AN EDUCATIONAL GAME**

Blockchain is a relatively new technology: an undisclosed person under the name Satoshi Nakamoto introduced its current architecture in 2008 in the white paper of Bitcoin (Nakamoto 2008). Despite its growing adoption, it is considered too complicated for the general audience and is currently mainly applied in business-to-business services (in case of trading, a business is represented by a sole entrepreneur). Performing a transaction on blockchain involves a number of technical hurdles; besides, trading cryptocurrencies requires a high level of financial literacy. Based on its white paper (playfully titled “White Pa-Purr”), developers of *CryptoKitties* intended to increase awareness about cryptocurrencies and blockchain and teach the basics of blockchain use to the mass audience. According to them, “the average consumer doesn’t understand what a cryptocurrency is or why it matters, let alone how the technology behind it works”. One way to solve this problem is “gamifying features that leverage blockchain’s unique applications” (*CryptoKitties* White Pa-Purr 2017).

In this section, we will evaluate blockchain-specific qualities of digital assets that are present in the game. I rely on the working definition of cryptocurrency by Jan Lansky (2018), because it specifically describes cryptocurrency as a system, so this system can be directly compared to the game system. For a relatively brief general overview of blockchain technologies, I refer to an analytic summary “The Truth about Blockchain” written by Marco Iansiti and Karim R. Lakhani for Harvard Business Review (2017): it presents perspectives on practical applications of blockchain in the context of their adoption, which aligns with the goals of *CryptoKitties*’ developers.

As “White Pa-Purr” claims, the game system of *CryptoKitties* incorporates the following features of blockchain technologies:

- **Decentralization.** This is the core of blockchain technology, always mentioned in the discourse around it. In the case of a digital game, it means independence from the provider, to the extent of full sovereignty in terms of data. “No single party controls the data or the information” (Iansiti & Lakhani

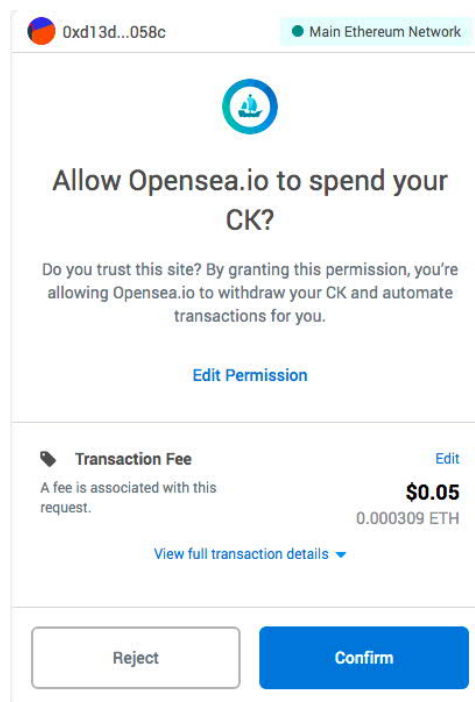
2017). This, the most important, quality of blockchain networks also characterizes technological architecture of the *CryptoKitties*' game system. In "White Pa-Purr", developers criticize centralization in other games, although they provide a relatively cautious assessment of it in their own game: "The economy and revenue model that we are exploring cannot be artificially influenced, for good or ill" (*CryptoKitties* White Pa-Purr 2017, my emphasis).

- **Cryptographically proven ownership** ("True ownership"). Blockchain-based solutions, such as cryptocurrencies, keep an indestructible record of cryptocurrency units and their ownership: "A transaction statement can only be issued by an entity proving the current ownership of these units" (Lansky 2018); "Once a transaction is entered in the database and the accounts are updated, the records cannot be altered" (Iansiti & Lakhani 2017). This is also true for *CryptoKitties*, at least at the level of the game system, and developers often mention this feature in the blog and other public presentations.
- **Uniqueness.** This quality is not present in regular cryptocurrencies, but it is related to a more general 'smart property' concept on blockchain, often implemented through 'non-fungible' (unique) individual tokens, most often on the Ethereum platform. *CryptoKitties*, as many other 'crypto games', uses non-fungible tokens, which means that they are unique and non-interchangeable. At the level of the game system, there are no two identical 'kitties' in the game (although there are lookalikes). This provides players with the hope that any kitty may be of value to someone under certain circumstances, officially imposed or negotiated by players - such as a part of a custom set or a 'mat' in a breeding event.
- **Scarcity.** This property is crucial for the game but relatively underrepresented and misunderstood in the crypto industry in general. Most popular cryptocurrencies are limited in supply by design, but none of them has reached the issue limit to become scarce yet. To start from, Bitcoin is supposed to reach the limit in approximately 100 years (Beedham 2019). According to Nakamoto himself - if we can believe the words of a mythical figure - the number of bitcoins is finite and limited by design at roughly 21 million coins (Satoshi Reply to Mike Hearn 2009), to prevent inflation. Meanwhile, in small-scale ludic economies, artificial scarcity becomes the basis for value construction, and this is how this particular property was supposed to function in *CryptoKitties*. As the developers stated, it was an experimental feature of blockchain tokens they were going to explore (*CryptoKitties* White Pa-Purr 2017).
- **Peer-to-peer trading.** This is an essential feature of blockchain-based currencies, highlighted in the concept of Bitcoin (Nakamoto 2008). Trading is also the main game mechanic of *CryptoKitties* together with breeding. Although not unique for this game - it has always been present in collectible games, especially the physical ones - it is crucially important for understanding cryptocurrencies and trading outside of the game context, and for development of financial literacy in general. This is what developers mean under the following statement in White Pa-Purr: "*CryptoKitties*' key game mechanics are tied to actions associated with cryptocurrencies and smart contracts" (*CryptoKitties* White Pa-Purr 2017). This implies buying and selling crypto tokens on the open market within the game or outside of it.

Let us elaborate on the lessons that can be learned from *CryptoKitties* by actually playing it. Uniqueness, scarcity, cryptographically proven ownership, peer-to-peer trading and decentralization build the core of the game system in *CryptoKitties*, and, as of 2020, they are typical for 'crypto games'. Three of these features - cryptographically

proven ownership and decentralization, and, to some extent, peer-to-peer trading - are also found in regular cryptocurrencies. Interestingly, the uniqueness and scarcity of *CryptoKitties* has transformed into fungibility by ‘wrapping’ them into a freely exchangeable form - a rather common process that can be characterized as “the economy of wrapped whatever” on Ethereum.

Decentralization and “true ownership” are executed to the fullest extent in the game, with some minor remarks. Technically, indeed, a token in a wallet cannot be taken away or destroyed by any centralized authority. Still, such ownership can be disputed if the wallet is kept anonymously. In addition, a crypto token can be stolen, lost, or stuck in an intermediary state between two wallets while cryptographic validation of the transaction proceeds, as it often happens in the game every time the Ethereum network gets clogged. Finally, many third party applications are used to play the game, such as the OpenSea marketplace and the protocol for ‘wrapping’ ‘kitties’ to trade them as non-unique, freely exchangeable tokens. These applications also obtain some rights to handle tokens in the game - of course, not without permission from the owners of these tokens, but this permission may be requested in a way that is rather confusing for a novice player.



**Figure 1:** A request from OpenSea in Metamask to allow the trade a token on April 17, 2020.

Scarcity and peer-to-peer trading are the most important for understanding the game economy and unleashing its educational potential. They have direct analogies in physical collector’s items and a variety of games of different genres, from *Magic the Gathering* (Wizards of the Coast, 1993) to *Neopets* (Powell, A., and Williams, D. 1999) to *Second Life* (Linden Lab 2003) to the *Pokemon* franchise. Actually, participation in any of these games can be a vital lesson on how to play *CryptoKitties*.

For example, in the game *Ovipets* (IdzTech 2011) players also own unique animal tokens, breed and sell them to peers for in-game money. The game design of *Ovipets* enables uniqueness and scarcity, based on html codes for different colors (somehow similar to blockchain-based scarcity), even though it denies full ownership and

independence from the provider. The in-game market has gone through many changes since 2011, but it is still relatively active in 2020 and can provide many potential clues to the developers of *CryptoKitties*.

The developers might need to study such cases, as their own experimentation with scarcity has not been particularly successful. As of November 1, 2019, there were more than 1.6 million kitties and only a few thousand active players. The approximate number of active players has not changed significantly as of April 17, 2020, although there has been a rebound on the market, and the number of ‘kitties’ was approaching 2 million for the reasons out of scope of this paper. With such a wealth of unique tokens, scarcity becomes meaningless. Some attributes and “fancy” editions are actually scarce, but most of them can easily be purchased on the open peer-to-peer market.

Based on this evaluation, educational potential of *CryptoKitties* in blockchain technologies and cryptocurrencies lies in its ability to promote cryptographically proven ownership, to illustrate the idea of decentralization and to teach important lessons about behavior of free peer-to-peer markets. Decentralization, in this context, means independence from the ‘coding authority’ who owns and controls the game world: a term used by Edward Castronova in relation to digital economies of virtual worlds (Castronova 2007). Coincidentally, in “Synthetic Worlds” (2007) Castronova uses the figure of the coding authority to show how scarcity of valuable objects can be manipulated in the game to drastically change its economy. This is exactly what blockchain-based games were aiming to avoid, to limited success. The core rules of *CryptoKitties* have been set in code on blockchain with its release, so the game system could not be changed later. However, it appeared that the wealthiest players could easily manipulate scarcity if they chose to do so. Because of token overproduction, the game economy started showing the signs of stagnation in the second year of the game’s history. Probably because of this reason, developers themselves started adding ‘scarce’ and unique ‘fancy’ tokens to the already existing game system to keep it alive, somehow contrary to its initial promise. These two loopholes – unsolicited abundance and manipulation by the wealthiest players - are two key takeaways about free digital markets everyone should learn from the game.

## **UN-LEARNING DECENTRALIZATION**

Based on how big the market of crypto tokens has become in only two years, gamification of peer-to-peer blockchain-based trading has been generally successful. As of November 1, 2019, two years after the debut of *CryptoKitties*, there were almost 200 blockchain-based games and playful decentralized apps listed on OpenSea. For the top five decentralized apps, the total 7-day volume of transactions reached or exceeded 100 ETH. This picture still remains consistent: the list of games, collectibles, playful experiences and digital art objects has been expanded to 370 positions on OpenSea as of April 17, 2020, and the top 7 ‘dApps’ demonstrated the 7 day trading volume over 100 ETH. The free open market is burgeoning, although not as transparently as it may seem based on the premise of open data on blockchain. Passive observation does not provide a complete picture: in fact, players often decide on the rules of trading in personal or collective communication outside of the market. Still, observation and reading other players’ guides can provide a crypto player with basic knowledge, as the common principle of “do your own research” suggests.

Our next question is how the game interface and the official guide afford and assist understanding blockchain technology and cryptocurrency use. At least, some form of trading necessarily precedes the game: players need to obtain the cryptocurrency Ether – purchase, or ‘mine’, or earn, or obtain by any other means acceptable (or unacceptable) in the crypto economy. Besides, they need to learn how to operate a crypto wallet, which may also be challenging.

Let us cast an experienced eye of a crypto gamer on the official guide as retrieved on November 1, 2019 (Axiom Zen 2017). It went through many changes in 2018, mostly to make onboarding easier. The “Getting Started” section begins with a very basic instruction on how to buy a ‘kitty’, but does not mention anything specific to blockchain networks. Unless the player is already familiar with the context, there are several steps missing in the tutorial: firstly, setting up a crypto wallet to log into the game, and secondly, obtaining cryptocurrency to buy the ‘kitty’. A determined player, motivated by the infamous DYOR principle, will find this information on the company website in the Dapper help center (Dapper Labs 2019). However, these are several more steps further from the game with even more context to obtain from scattered sources - for instance, from the community members (who might or might not have not experienced the same problem) or from web search.

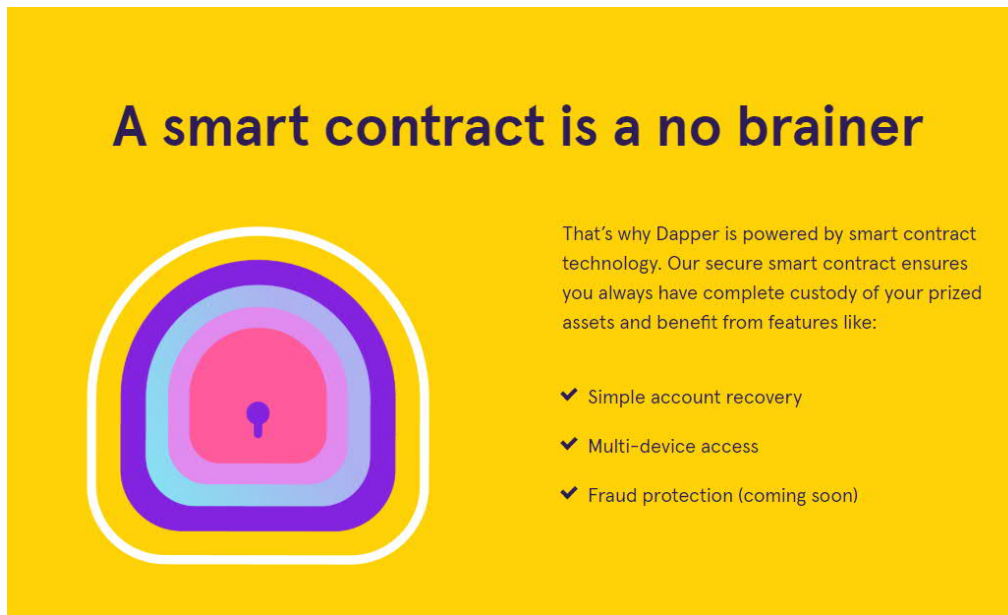
In blockchain-based games, the player account equals to a cryptocurrency wallet that can hold several types of cryptocurrencies, as well as various game assets (tokens). When *CryptoKitties* was launched, a popular crypto wallet, MetaMask, was the default solution to log into the game, even though developers were already planning to explore its alternatives for easier onboarding (*CryptoKitties* White Pa-Purr 2017). Before 2019, MetaMask was the most common solution for cryptogames in general, presumably reaching 90,000 weekly active users in April 2019. *CryptoKitties* had about 300 daily users at that time, and yet, back then, with the average daily volume of approximately 40 ETH, *CryptoKitties* still was the third most popular application by cryptocurrency transaction volume on MetaMask (see official MetaMask analytics report from Dresser 2019).

Since 2019, the default entry point to *CryptoKitties* is Dapper (Dapper 2019). Dapper is proprietary software developed by Dapper Labs, the team behind *CryptoKitties*. Its main differences from MetaMask and many other wallets is at least some degree of centralized control over the user account by the developer company. Specifically, the account is confirmed with a phone number, which contradicts one of the core principles of cryptocurrencies: “Ownership of cryptocurrency units can be proved exclusively cryptographically” (Lansky 2018, 19). Also, input of a mobile phone number means de-anonymization in many countries of the world, unless specific measures are taken, such as, buying a pre-paid SIM card in one of the countries where it is possible, or setting up a ‘secret’ phone number at a paid online service. The company states that the phone number is needed to reduce the number of spam requests to create a new wallet (*CryptoKitties* 2019), but this limitation can be easily bypassed by any of the aforementioned means.

This undermines one of the main ‘selling points’ of blockchain-based games, namely, full and sole control over one’s crypto assets ( (Iansiti & Lakhani 2017; Lansky 2018; *CryptoPunks: The Solution To Digital Art* 2018) - which, naturally, comes with sole responsibility for their losses. Besides, installing MetaMask is not a particularly demanding procedure: there is very little difference from installing any other Chrome extension, apart from the ‘seed phrase’, which is required to activate the wallet on every next device. In addition, MetaMask does not require any personal information from the user. Meanwhile, providing a personal phone number to a third party can be a leap of faith for many players, especially those from the countries where cryptocurrency trade is limited or prohibited.

Dapper Labs actively encourages their players to move their assets from MetaMask or other wallets to Dapper (*CryptoKitties* 2019). According to the company, the main reason to switch to a proprietary wallet has been inability to recover it if a player loses the secure ‘seed phrase’ to their MetaMask wallet. Still, the user base has not grown since the introduction of the Dapper wallet; in fact, based on open analytics, the number

of daily players decreased almost twofold since then, and still remains on approximately the same level in April 2020 (DappRadar 2020).



**Figure 2:** A screenshot from the Dapper Lab website, obtained on November 1, 2019, states account recovery as the first priority and fraud protection as the last one.

Developers offered many incentives to players to use Dapper. As of November 1, 2019, with the new Dapper wallet, developers compensated so-called ‘gas fees’ - obligatory transaction fees for players. This may lead to the following consequences:

- 1) The game becomes centralized: developers are paying the maintenance fee, which is supposed to be the duty of players in truly decentralized blockchain-based gaming;
- 2) The game does not teach new players how Ethereum operates;
- 3) If the fees are reintroduced later, it will cause some of these players to abandon Dapper.

It is important to understand that transaction fees - ‘gas fees’ paid in Ether - are an unavoidable part of all transactions on Ethereum. Therefore, the company eliminates the need to experience and learn one of the most important features of blockchain technologies, which is decentralization. Ironically, “fraud protection” is not a priority, based on the company’s website on November 1, 2019 (Fig. 2).

### **QUESTIONS UNANSWERED: BEFORE THE ONBOARDING**

As we have discussed in the previous section, playing *CryptoKitties* requires small amounts of Ether for every transaction, that is to say, for every move in the game: buying, selling, sending a ‘kitty’ as a gift, putting it for sire or for sale, canceling siring or sale, or showcasing it on an external marketplace. This also contributes to monetization of the game: developers receive 3.75% of every transaction on the in-game market. This is the reason why many players (including myself) chose to trade on OpenSea: fees are lower and ‘kitties’ can be bred while on sale. OpenSea still receives 2.5% of every transaction. Apart from the market fee, there is a gas fee for putting the token on sale, which is smaller at OpenSea and is only paid once. At



CryptoKitties’ own marketplace, with a standard MetaMask wallet, the fee has to be paid every time, and a ‘kitty’ cannot be bred while on sale.

Even before learning all this contextual information - mostly outside of the game - the first question from the player completely unfamiliar with cryptocurrencies is where to obtain Ether. This is the least transparent part of the game. Buying cryptocurrencies for real money is still a challenge almost anywhere, although it is easier in the EEA countries and North America. While buying is not prohibited, although limited to a different degree depending on the jurisdiction, selling cryptocurrencies for real money is not permitted or even illegal in many countries. Coinbase is seen as a default option for cryptocurrencies trade by American users (Stephens 2017). Many cryptocurrency enthusiasts automatically assume that anyone should be able to buy cryptocurrencies with their credit/debit card or Paypal, at any time, in any quantity. Surely, it has been somehow possible in some European countries since 2015. The US citizens could buy cryptocurrencies with both a debit card and PayPal on Coinbase since 2016, and Canada followed soon after. Nevertheless, in 2018, when primary research for this paper was conducted, Coinbase was only available in 32 countries, and it was still impossible to buy cryptocurrencies with real-world money in some of them. This number reached 103 countries in May 2019 (Coinbase 2019). As of the end of 2019, Coinbase allowed buying Ether with a debit card and PayPal in all countries of the European Economic Area. It specifically mentions such territories as Andorra, Gibraltar, Guernsey, Isle of Man, Jersey, Monaco and San Marino, - all these territories have a special role in the cryptocurrency trading, gambling and investment industry due to their status as special economic areas. Finally, buying with a debit card is available in Singapore, Australia, Mexico and Chile. (Coinbase, retrieved on November 1, 2019).

This leaves out most of the world territories outside Northern America and the European Union, including the state of the author’s citizenship, so there is no way to purchase a ‘kitty’ in a convenient and legal way. This aligns with findings on cryptocurrency adoption from Parino et al. (2018): according to them, Bitcoin adoption was faster in wealthier countries with more economic freedom, not the ones that suffer from government restrictions and rapid inflation, as cryptocurrency enthusiasts would hope. Also, this limits the educational potential of *CryptoKitties* – or, maybe, expands it, if we take into account various methods to “play against the system”.

Anyway, we should acknowledge that the situation started improving in 2019, after the main part of the initial research has been conducted. The company’s own wallet, Dapper, came integrated with Moonpay and Simplex. Moonpay works in EEA countries, Canada, Russia, Hong Kong, Japan, Mexico, South Africa, South Korea and the UK (MoonPay 2019). Simplex works globally, excluding so-called high-risk countries from the FATF list (Simplex 2019). Still, the final decision to proceed with the transaction is made by the bank that has issued the debit card. This still means a lot of uncertainty and risk for the end user, and contradicts the initial philosophy of cryptocurrencies (Nakamoto 2008; *CryptoKitties* White Pa-Purr 2017; Cock Foster 2018): this way to use cryptocurrencies can no longer be seen as “decentralized”, “anonymous” or “borderless”<sup>2</sup>.

## **CRYPTOKITTIES AS GAMIFICATION**

So far, we have been looking at the practical potential of learning blockchain technologies and cryptocurrencies with *CryptoKitties*. We have found out that, at least at the beginning, the game is not organized in a proper way to make players more literate in blockchain technologies. Paradoxically, it still plays a very important role in blockchain adoption: it gamifies the experience of those already familiar with blockchain technologies and cryptocurrency trading.

*CryptoKitties* is only one example of a game based on Ethereum, an open source blockchain platform for decentralized applications (dApps) fueled by the cryptocurrency Ether (Buterin, n.d). Gamification in game studies is usually understood as application of elements of game design to non-ludic activities (Deterding et al. 2011). From this viewpoint, *CryptoKitties* is the exact opposite. It is a game, with a system of rules and an end goal (breeding the highest-level ‘kitty’), to which developers have added a ‘real’ cryptocurrency, to much annoyance of casual players used to the free-to-play model. But, as we have discussed at the beginning of this paper, the ultimate goal of the developers was to enhance players’ experience with Ether by making it playful. From this point of view, it is not ‘moneyfication’ of a game, but gamification of a market, or “service gamification”. This type of gamification is described as “a process of enhancing a service with affordances for gameful experiences in order to support users’ overall value creation” (Huotari and Hamari 2016, 25). In our case, “service” stands for the Ethereum platform, and the value is created through breeding and trading digital cats and assigning custom (and sometimes irrational) values to them. These unreliable and unpredictable values still might mean more to players than thoroughly calculated market moves.

Much like Bitcoin, or even to a greater degree due to its lesser popularity, the use of Ether as a cryptocurrency in everyday situations is impossible in most cases and generally inconvenient in others. It can be argued that games like *CryptoKitties* provided use cases and created new types of value for cryptocurrency previously mostly used for trading and speculation. This was an intentional consequence: developers directly addressed this lack of function in the “White Pa-Purr”. The explosive launch of the game was followed by exponential growth of various decentralized gameful apps in 2018, as we can see from Figure 3. As a result, today Ethereum developers and Ether traders are facing a completely different challenge: unfortunately, the Ethereum network is hardly scalable and becomes clogged too often (ConsenSys 2018) since a whole new ecosystem of ‘dApps’ emerged on it.

Historically, success of *CryptoKitties* has been a pivotal point in development of new markets where experienced traders and early blockchain adopters can test and enjoy new experiences and opportunities. As of April 17, 2020, there are almost 1800 dApps from all categories on DappRadar, including games, DeFi (decentralized finance) applications, gambling, cryptotoken exchanges, collectibles, marketplaces, social apps and risky investment projects (DappRadar 2020). From this viewpoint, introduction of the game into the blockchain ecosphere should be seen as gamification of cryptocurrency trading in general, as a particular service economy.

Starting from this, we can identify more realistic educational potential for ‘crypto games’. Prospective learners are supposed to be already familiar with blockchain technologies, including basic operations with cryptocurrencies. Ideally, they already possess crypto assets, and they can access a bigger multi-player ecosystem on a blockchain platform. Still, they need to understand how value is created within this ecosystem. If they see themselves as individual traders or entrepreneurs, they also need to realize ambiguous ethics of free markets, typical cheats and tricks of peer-to-peer trading, lack of protection in absence of a higher authority, as well as manifold ways in which property rights are executed and sometimes lost in different forms of legal (and not-so-legal) ownership. This makes crypto games a suitable platform for business simulator games - in fact, it is possible to learn much of this simply by playing *CryptoKitties*.

## Ethereum Network Utilization

Source: Etherscan.io  
Click and drag in the plot area to zoom in



**Figure 3:** Ethereum network utilization frequently exceeds 95% since playable decentralized apps have been introduced at the end of 2017. Source: Etherscan 2019.

### **AUTOETHNOGRAPHY AS A METHOD IN HIGH RISK ENVIRONMENTS**

Education in blockchain technologies has taken many forms recently, from online Master's degrees to scam courses sold through Multi Level Marketing schemes. A positive example comes from the already mentioned Coinbase: after completing free MOOCs on less popular cryptocurrencies, learners get a small amount of cryptocurrencies to incentivise their practical use (Coinbase 2019). The most important lesson here is to start trading and learn in the process - without the initial set of barriers on the way to cryptocurrency acquisition.

Education in finances in general is a special case due to many possible risks. In her much cited summary on financial literacy education and its outcomes, Willis suggests that "the gulf between the literacy levels of most Americans and that required to assess the plethora of credit, insurance, and investment products sold today - and new products as they are invented tomorrow - realistically will not be bridged" (Willis 2008, 201). With loans and deposits in mind, she writes that common knowledge of finance is not enough to make decisions in a volatile market oversaturated with complex products. Same, and to an even bigger extent, can be said about cryptocurrency trading and the many emerging forms of decentralized finance. Also, this is my experience of playing *CryptoKitties*.

My interpretation of the game presented here relies on documented autoethnographic observation (one documented year of playing and regular comebacks since then). Critical distance required by the autoethnographic method was achieved by contrasting earlier and sometimes naive impressions with the later stages of my own gaming experience and research. During the first year, I went from a complete novice in blockchain to a confident player, and eventually became a somehow sustainable, even if by no means wealthy, ‘kitty peddler’. At the latter stage, already being a researcher in blockchain technologies, I could compare my initial impressions from the game to their later and more understanding interpretations and evaluate their significance within a larger context of blockchain-based games.

To achieve this, I kept a detailed player’s diary from November 2017 to December 2018. Initially, it was kept only occasionally, as its author had very little idea about the game and what to do in it. Besides, *CryptoKitties* requires significant funds to play: in the end, total investments exceeded €300 in equivalent. This is, as a blockchain researcher Quinn DuPont pointed out, the ‘pay-to-play’ aspect of cryptocurrency research, often missed during ethical evaluation of such work (DuPont 2020). Initially, these were the money from general state funding of my Master’s degree in Lithuania. Even with this support, my funds were too low to participate fully: at the initial stage, the game stopped when the player ran out of money, sometimes for months. Still, as my competence grew, I started to play daily in the last three months; this is when I have finally learned to break even.

This approach is not without ethical ambiguities. According to DuPont, purchasing cryptocurrency for research purposes is already burdened with a conflict of interest (DuPont 2020). However, gaining profit by playing ‘crypto games’ appeared to be almost impossible with my limited funds and trading experience. Even though I still see my collection as valuable, it would take speculator’s skills beyond my own abilities to sell it for any considerable sum in Ether.

## **THE ACTUAL LEARNING OUTCOME**

Autoethnography remains an important method in studying ‘shadow economies’ and exploitative games. Julian Dibbel’s studies of MMO games (Dibbel 2006) are the first and the most influential example. Recently, this method has been used in researching exploitative game design of free-to-play games: Heinrich Söbke’s four year documented experience of playing *FarmVille* (Söbke 2015) and David Nieborg’s critical account of “crushing candies” in *Candy Crush Saga* (Nieborg 2015) are two notable self-experiments.

In addition to the ethical relief of using a fully informed and eager subject, actual experience in the game is crucially important to understand how it works. Neither the official guide nor analysis of the game system could prepare the author for the actual experience of investments in cryptocurrency assets. Probably the most memorable transaction involved exchange of a large amount of cash for cryptocurrency on behalf of another person at a local graveyard, and this is where I would like to put the limit on an autoethnographic method.

Other methods were used to verify my exciting autoethnographic adventures. Namely, I reached for the community, interviewed some of its members and even made friends with them. Still, it would pose another ethical challenge to ask about the sources of Ether in their wallets. To explain the difficulties of cryptocurrency use without compromising any of my collaborators, I will briefly describe how I obtained Ether for playing the game in 2018.

- Firstly, I bought Ether at a small unregulated decentralized peer-to-peer exchange. There were many of them in 2018, and their operations and practices deserved another ethnographic study. To put it shortly, there was always a question of safety and fees, and legality was not even in question. I could not evaluate the risks myself, so I chose this exchange based on a recommendation from a friend, who was a systems engineer and an enthusiast of new technologies.
- Secondly, I received Ether as payment for work at an international cryptocurrency-related project: its team accepted payments in cryptocurrencies from their partners, so they could pay me in Ether for my services, based on our oral mutual agreement. However, there would be no legal protection for either party in case of breach of this agreement.
- Thirdly, I earned a small amount of Ether by freelance work for a blockchain-related startup. Work included, among other things, astroturfing in social media to make the project look more enticing for potential investors. No binding agreements existed in this case as well. The project was supposed to be managed as a DAO (blockchain-based decentralized autonomous organization), but this was never fully implemented.

After a year, my crypto gaming skills improved, and I started occasionally making money by trading ‘kitties’. The game became more or less self-sufficient for me at this point. Still, disclosing more details about any of the mentioned ways to obtain Ether would put me and other parties into a vulnerable position even though no laws were explicitly broken in the process. Anyway, most of these transactions would take a lot of effort to be presented as legitimate in all jurisdictions of all countries involved, and none of them involved any country from the Coinbase operations list.

What have I learned from ‘crypto games’? When we turn to the critique of educational games by Jonas Linderoth (2010), we can argue that blockchain-based games eliminate the main subject of critique: much of the game-related actions and interaction happens in the ‘outside’ world of real trading and peer-to-peer communication. The skills learned to play the game are the same skills one needs to use cryptocurrencies in any other situation, and also, to trade on a free market (and - only in theory - to conduct illegal financial activities by use of pre-paid phones and unmarked cash). But also, much as in the latter case, learning comes with financial losses. Although these losses are measured in cryptocurrencies obtained from borderline legitimate sources, they are still very real to the player.

Video games are supposed to be ‘half-real’ (Juul 2005), but what is effectively real in video games? Their rules are easily bypassed and transgressed even when written in blockchain. In my opinion, like in a once popular song, it is usually ‘lawyers, guns and money’: property rights, propagandistic violence and real-world exchange value. While our case is exceptionally non-violent and inclusive (many special events in *CryptoKitties* celebrated cultural and gender diversity, in general and in informational technologies and science in particular), it promises, and somehow enables, legal ownership of game assets and a possibility of real-life income from playing the game. This is how the game becomes real, and its most important lessons are learned in the real world, beyond the scope of the official rules, player guides or a friendly community.

## CONCLUSION

According to their enthusiasts, the main problem of blockchain technologies is lack of mass adoption (Iansiti & Lakhani, 2017). Taking this as a starting point, developers of *CryptoKitties* convincingly introduced the game to the general public and investors as a case of gamification of cryptocurrencies. In their initial vision, “*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” (*CryptoKitties* White Pa-Purr 2017). In this paper, I attempted to identify the signs of such empowerment based on the actual gaming experience.

Indeed, the game can teach us important lessons about decentralization, private property and free peer-to-peer markets. However, its developers might have missed the lesson from the already existing pet simulator games and in-game peer-to-peer markets. Blockchain-based or not, uniqueness and scarcity do not automatically mean value, and they are far too easy to manipulate in digital worlds. Developers themselves seem to have realized it, as they returned to the model of centralized, authority-manipulated scarcity and continued issuing new limited ‘fancies’ later in the game.

From today’s perspective, many of the initial developers’ goals outlined in the white paper are not likely to be achieved. In fact, the game does not make actual technologies behind the “esoteric concepts” more accessible to the audience previously unfamiliar to trading. Beginner players have to make the most problematic steps in mastering cryptocurrencies by themselves, without much assistance from either the game or its developers. Even such important features as decentralization are modified for the sake of easier onboarding, and less desirable but structurally necessary elements such as transaction fees on Ethereum are also being left out.

Hardly functional as an educational tool, *CryptoKitties* is still a successful example of market gamification. If we see cryptotoken trading in whole as a set of specific digital services, we can imagine ‘crypto games’ as gameful experiences embedded into globalized blockchain-based financial activities. In this context, gamification means gamifying the whole market of cryptocurrencies, and utilization of the Ethereum network is only one, most easily observable, symptom of its success.

As my own experience has demonstrated, the most meaningful lessons are learned outside of the game. They apply to the real world even to a larger degree than to the game world. This makes ‘crypto games’ a suitable platform for business simulators - for example, as working models of unregulated markets and self-sovereign entrepreneurs.

## BIBLIOGRAPHY

Axiom Zen. 2017. *CryptoKitties*. Online game. Dapper Lab.

Beedham, M. 2019. “85% of the world’s Bitcoin has been mined. It’ll be at least another 100 years to 21 million”. *The Next Web*, 1 August. <https://thenextweb.com/hardfork/2019/08/01/85-percent-bitcoin-mined-cryptocurrency>.

Buterin, V. n.d. *Ethereum White Paper*. [http://blockchainlab.com/pdf/Ethereum\\_white\\_paper-a\\_next\\_generation\\_smart\\_contract\\_and\\_decentralized\\_application\\_platform-vitalik-buterin.pdf](http://blockchainlab.com/pdf/Ethereum_white_paper-a_next_generation_smart_contract_and_decentralized_application_platform-vitalik-buterin.pdf)

Castronova, E. 2005. *Synthetic Worlds: The Business and Culture of Online Games*. Chicago: University of Chicago Press.

Cock Duncan, F. 2018. “Dreams of a decentralized future: video games on the blockchain”. Blog post. 1 June. <https://medium.com/@duncancockfoster/dreams-of-a-decentralized-future-video-games-on-the-blockchain-f3ce90f51d1>

- Coinbase. 2019. “Expanding USDC crypto trading globally”. Blog post. 14 May. <https://blog.coinbase.com/expanding-usdc-crypto-trading-globally-322a3d670d59>
- ConsenSys. 2018. “The Inside Story of the CryptoKitties Congestion Crisis”. Blog post. February 20. <https://media.consensys.net/the-inside-story-of-the-cryptokitties-congestion-crisis-499b35d119cc>
- CryptoKitties. 2019. “Bring your CryptoKitties to Dapper”. Blog post. 11 May. <https://www.cryptokitties.co/blog/post/bring-your-cryptokitties-to-dapper>
- CryptoKitties White Pa-Purr*. 2017. Version 2.0. [https://drive.google.com/file/d/1soo-eAaJHzhw\\_XhFGMJp3VNeQoM43byS/view](https://drive.google.com/file/d/1soo-eAaJHzhw_XhFGMJp3VNeQoM43byS/view)
- “CryptoPunks: The Solution To Digital Art”. 2018. Dapp.com. 2 December. <https://medium.com/dapp-com/cryptopunks-the-solution-to-digital-art-8e34302aed77>
- Dapper. 2019. <https://www.meetdapper.com/>
- DappRadar. 2019. <https://dappradar.com>
- Deterding, S., Khaled, R., Nacke, L., and Dixon, D. 2011. “Gamification: Toward a Definition”. *CHI 2011 Proceedings*, May 7–12, Vancouver, BC, Canada.
- Dibbell, J. 2006. *Play Money: or, How I Quit My Day Job and Made Millions Trading Virtual Loot*. Basic Books.
- Dresser, B. 2019. “MetaMask Metrics: a first look”. Blog post. 23 May. <https://medium.com/metamask/metamask-metrics-fbec0e2ceaa7>
- DuPont, Q. “Guiding Principles for Ethical Cryptocurrency, Blockchain, and DLT Research.” *Cryptoeconomic Systems*, 2020. <https://doi.org/10.2139/ssrn.3431738>
- Huotari, K., and Hamari, J. 2017. “A definition for gamification: anchoring gamification in the service marketing literature”. *Electronic Markets*, Vol. 27, 21-31.
- Iansiti, M., and Lakhani, K.R. 2017. “The Truth about Blockchain”. *Harvard Business Review*, Vol. 95, no. 1 (January–February 2017), 118–127.
- Juul, J. 2005. *Half-Real: Video Games between Real Rules and Fictional Worlds*. Cambridge, Mass.: MIT Press.
- IdzTech. 2011. *Ovipets*. Online game. IdzTech.
- Lansky, J. 2018. “Possible State Approaches to Cryptocurrencies”. *Journal of Systems Integration*, Vol. 9, no. 1, 19–31.
- Linden Lab. *Second Life*. 2003. Virtual world. Linden Lab.
- Linderoth, J. 2010. “Why gamers don’t learn more. An ecological approach to games as learning environments”. *Nordic DiGRA Proceedings*.
- MoonPay. 2019. <https://www.moonpay.io>
- Nakamoto, S. 2008. *Bitcoin: A Peer-to-Peer Electronic Cash System*. White Paper. <https://bitcoin.org/bitcoin.pdf>
- Nieborg, D. B. 2015. “Crushing Candy: The Free-to-Play Game in Its Connective Commodity Form”. *Social Media + Society*, Vol. 1, No. 2.
- Parino, F., Beiró, M. G., and Gauvin, L. 2009. “Analysis of the Bitcoin Blockchain:

- Socio-Economic Factors behind the Adoption.” *EPJ Data Science*, Vol. 7, no. 1, 16 October, 38.
- Powell, A., and Williams, D. *Neopets*. 1999. Online game. Viacom.
- “Satoshi Reply to Mike Hearn”. 2009. Nakamoto Studies Institute. 12 April. <https://nakamotostudies.org/emails/satoshi-reply-to-mike-hearn>
- Simplex. 2019. <https://www.simplex.com/>
- Söbke, H. 2015. “Gaming a Non-Game? A Long Term (Self)-Experiment about FarmVille”. *Well Played*, Vol. 4, 215-250.
- Stephens, L.S. 2017. “How To Buy a Cryptokitty: The Complete Guide + DNA Sequencing”. *Hackernoon*. 4 December. <https://hackernoon.com/how-to-buy-a-cryptokitty-the-complete-guide-dna-sequencing-26e14596a9cf>
- Willis, L. E. 2008. “Against Financial Literacy Education.” Social Science Research Network, March 13, Rochester, NY. <https://papers.ssrn.com/abstract=1105384>
- Wizards of the Coast. 1993. *Magic the Gathering*. Collectible game. Hasbro.Blizzard Entertainment. 2004.

## ENDNOTES

1 The first crypto game is *CryptoPunks*, which went live in summer 2017 (*CryptoPunks: The Solution to Digital Art*, 2018); also, *CryptoPunks* are mentioned in the “*CryptoKitties* White Pa-Purr” as an example of unsuccessful crypto game (2017).

2 Later, the developers of *CryptoKitties* have tried to make it more accessible for the general public by changing the default option in the game interface to “Buy with credit card” in summer 2019. This integration brought players to Nifty Gateway, which is another solution with an interesting history worth a lengthy analysis and not particularly user friendly, or even operational, now.