

Blockchain games, an alternative world

thecryptofruit, May 2020

Introduction to a non-Earthly society

Computer games got power boosters with the Internet, when direct interaction and communication with players became possible and that made it more fun than ever before. Now, players get super powers with blockchain technology, which makes them the true masters of their game characters. But there's more. Game economies, as vibrant as they were already (see Edward Castronova's excellent book *Wildcat Currency*), now involve real money.

Blockchain gaming is getting more attention since 2019, though it did have some peaks in previous years (for the numbers of daily active users through the years, see the research by Tian Min, Hanyi Wang, Yaoze Guo, Wei Cai, published in 2019). It is not just due to several scalability solutions making gaming possible for the first time in history, likely it has to do with the open nature of this technology, where developers can try and fail cheaply and, just as important, there are no gatekeepers to block eager innovators (see the case when Blizzard banned a user for political reasons [sic!], only for him to be welcomed in the blockchain community with open hands: <https://medium.com/@nederob/gods-unchained-supports-banned-hearthstone-player-8dc6426cd800>). Nevertheless, the times are still quite hard, as the communities are small and some are giving up (see the example of Loom below).

Is blockchain gaming interesting for investors? Some games are getting tens of millions of dollars. Is it interesting for speculators? Few parcels of land in metaverses were already sold for ten thousand dollars and we do know the tragicomical story of CryptoKitties, funny looking blockchain cats that brought Ethereum to its knees. Will blockchain gaming be more interesting tomorrow than it is today? I think so. I think that the dotcom bubble, the 911, the financial crisis of 2007-08, the covid19 crisis, the whatever crisis, all expand the fear in the real world and, much like wild animals seek refuge when we slash and degrade their habitats, people also seek safe places, any we can find, including virtual ones.

Are games better when built on blockchain? There's many arguments, however even beyond the technology used, they enable the emergence of new virtual communities, combining both the fun and the money. Blockchain games also unlock the creation of metaverse-native brands and, what's even more interesting, they enable the duality as well as transitions of brands between the meta and the "real" world.

As in any community, in blockchain gaming we are also witnessing the formation of subgroups with their own value preferences, there are partnerships and competitions, friends and foes ... as there is also money involved, this resembles the dynamics in the real world very well, just without a physical contact between players. The post-covid19 relationships seem to fit well in this non-physical environment.

It is also an alternative world, where misfits can find refuge, it is a grand new venue for artists to showcase and sell their works. Beyond entertainment and art, in the not-so-distant-future metaverses might also prove to be one of very few escape paths for disillusioned cypherpunks with broken knee caps.

Is it still entertainment if it is profit-oriented, or becoming a money-driven endeavor, much like professional sports? Panem et circenses, all the way down. With hyper-tokenization and monetization of more and more aspects of life, it is noteworthy to remember the distinction that Yanis Varoufakis made between the exchange value (\$) and the experiential value (∞).

>> Fantasy >> Cyberspace >> Metaverse >> Human Obsolescence >>

Metaverse: "The convergence of 1) virtually enhanced physical reality and 2) physically persistent virtual space. It is a fusion of both, while allowing users to experience it as either.

Our collective online shared space. Shareability and the participatory web are even more fundamental attributes than dimensionality." - from the Metaverse Roadmap Foresight Framework. 2007. These worlds being 2D or 3D, as mesmerizing as that presentation is, is much less important than their radically different ecosystem.

<http://metaverseroadmap.org/inputs4.html#glossary>

The "techno-futuristic" narrative about *cyborgs*, part-organic part mechanic, that appeared in 1960' (see *Cyborgs and space* by Manfred E. Clynes and Nathan S. Kline, 1960, <http://web.mit.edu/digitalapollo/Documents/Chapter1/cyborgs.pdf>), were

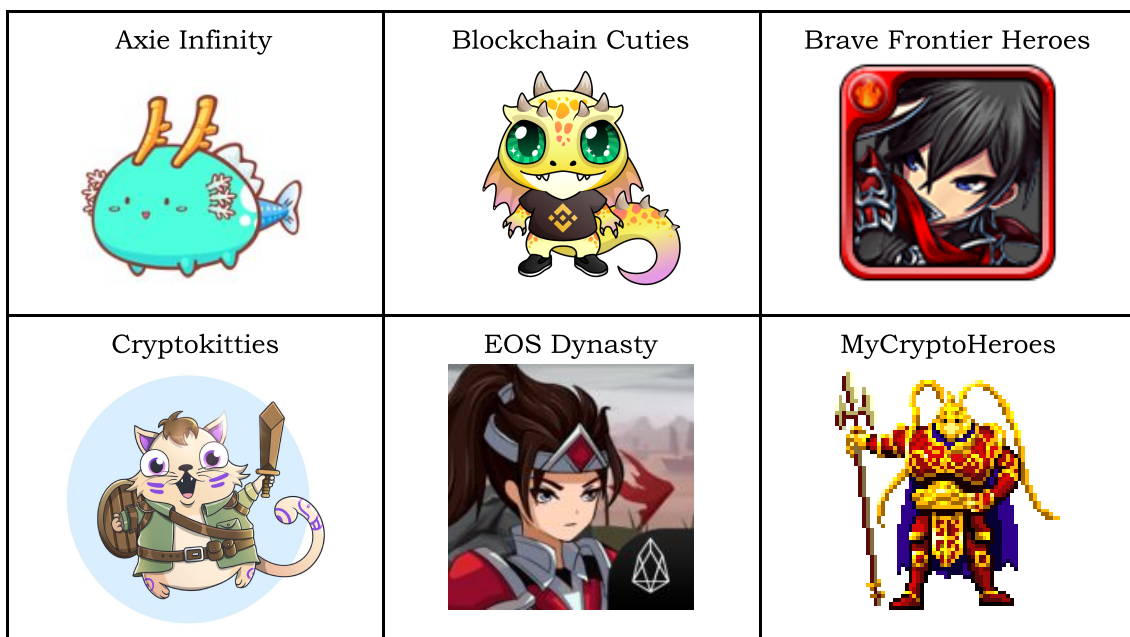
likely the baseline for *cyberspace* (coined by William Gibson, the author of the famous *Neuromancer*, in the story *Burning Chrome* in 1982) where technology connects people and devices globally, thus focused perhaps more on communication aspects, as is cyberspace now interchangeable with the Internet. As the Internet permeates our lives more than we care to admit, the term *metaverse* was introduced (by Neal Stephenson in the story *Snow Crash*, 1992), which better represents a multi-layered world - one that is physical as it is actionable by humans, and another one, that is cybernetic, technical, data-obsessive, even mechanical. Virtual worlds that are emerging as massively multiplayer online role-playing games (MMORPG) are revealing us a glimpse into what is to come; now more so than ever with these games being built on a decentralized infrastructure, that not only makes players own their in-game characters, clothes they wear/create/buy in the game, but also own parcels of in-game land and any other assets of interest. Owning is key, it makes these worlds more real than ever. Blockchain is key, as well, as it gives players money. Whether we call it virtual currency, digital currency or just points, it is money and this money has a meaning in the game and a meaning outside, one can exchange it for common fiat currency. Thus, this is no longer just a game, it is also a business. One creates a T-shirt in a game, as artsy as desired, then this T-shirt can be worn by a character, sold, or even printed in real life. What's coming, is likely not too far from Yuval Harari's predictions about human *obsolescence and the domination of AI-driven biotech things*, or, to put it in pop terms, "collectively coordinated enhanced humans".

As much as the physical world is entertained with games and spends money for pleasure, there are also powers operating in the opposite direction, where the agents in the virtual world are observing, tracking, recording, and increasingly affecting the physical world. With no real human-authentication proofs, not every user we meet on social platforms is who he/she is, or is even human. Facebook has a swarm of bots deployed in live infrastructure that are "studying" users, but there's no way for users to be sure studying is all they do: see <https://research.fb.com/wp-content/uploads/2020/04/WES-Agent-based-User-Interaction-Simulation-on-Real-Infrastructure.pdf>. We are used to having companies flashing "verified account" badges on the Internet, even users have such badges to hold a claim on an account, it is not unimaginable that in the future we see "valid human" badges placed next to our avatars.

Childish designs, an indication of something?

I am curious about the manifestation of entertainment and whether it reveals some underlying facts about the players or society in general. Admittedly, it has been decades since I last indulged in playing games, however the following contemplation is honestly well-intended.

Considering the complexity of the technology involved, one might expect that the games are going to be very sophisticated or deep. However, in many cases, the opposite is true. Take a look at these designs from a couple of the more popular games, some of them secured millions in investments:



Funny, silly, cartoon-like design and characters ... what does it mean? A younger audience? It is hard to believe that younger teenagers would be that interested in cryptographic custody of a wide-eyed game character, though one could speculate that the explanation is more on par with trading chewing gum, but here replacing gum with real money. Could it instead indicate escapism à la comic books? A reduction of consciousness to a more undeveloped state, whereby one replaces the raw experience of the physical world for a child's interpretation of life that includes cartoon characters, eating cookies and sipping milk while being comfortably bent in a gaming chair? It baffles one's mind, as these designs have little to do with blockchain's core feature of censorship resistance that would presumably indicate the type of early adopters of blockchain gaming. It seems it is a mesh of "serious fun".

Influencing and surveilling potential

In the post-covid19 world, the all-seeing eye has the ultimate lever to impose mass surveillance. Central Bank Digital Currencies made a state transition from dismissive to strategic, as is the case with “China first” CBDC (see <https://global.bsnbase.com>). Facebook’s failure to launch it’s digital currency Libra did fail in 2019, but they learned from the initial rejections and are about to launch Libra v2. Even if it fails again (for example due to the opposition against stablecoins, as indicated by G20), the appetite is clear and with money to spend, the wheels will not stop. Back to entertainment ... Facebook Gaming - Tournaments launched in April 2020, so people can spend even more quality time on the platform, <https://www.facebook.com/fbgaminghome/creators/tournaments>.

It is worth noting that there are no privacy contemplations in metaverses so far. It is as transparent and public as Bitcoin’s initial naive transaction type Pay-to-Public-Key (see the explanation here: <https://bitcoin.stackexchange.com/questions/32639/why-does-the-default-miner-implementation-use-pay-to-pubkey/32642#32642>), meaning that what happens in a metaverse is for the world to see. With time, the ramifications will warrant re-considering this subject. Think of possible, even probable, things like metaverse cartels and cabals, who want to carry some actions shielded from the public, or healthcare as a virtual-reality service in a virtual world for virtual characters or even as an augmented real-world service. The imagination is the limit, but note that digital environments are easy to monitor, infiltrate and influence.

Advantages of blockchain tech in games

There are many advantages of including blockchain technology in the gaming stack. Some will only be manifested in the future, when the ecosystem matures, but it doesn’t look that anything can stop the wheels turning, because the theoretical aspects are largely already solved, now in the implementation phase, but also because Satoshi Nakamoto cannot be uninvented - cat’s out of the bag. Here, the advantages are listed in no particular order, bar the first one.

True digital representation of things, whether physical items or in-game assets. “True” in the sense that it has an irrefutable and unchangeable description, a known owner (holder of the token) and no double-spends i.e. it can’t be copied and multiplied like any other digital files.

Ownership of a digital item, that is explicitly provable, for example via an undisputable digital signature. The ownership is manifested within a game

and equally outside the game. It can be transferred to others easily, it can also be delegated temporary or granted any other arbitrary permissions. Sometimes, the ownership is only implicit, but can be made explicit on demand, for example a game can pre-allocate certain items to a player, who can claim them in a sovereign way whenever desired (see *segregated activation*).

Transfer of one's game assets is unrestricted. The game companies no longer have discretionary power to give or to take an asset that a user controls. It might not sound important to non-gamers, but one only has to consider the amount of time a player invests in the game, e.g. for developing a character, establishing trust in the community, building a network of co-players. There are many emotional stories published online about disgruntled players who were left empty-handed when the company changed direction, abandoned the game or updated it with breaking changes.

Trading of game items is bigger than most of us are aware of. The economy in many games resembles the "real" economy both in complexity and liveliness. With blockchain-based game assets, trading is suddenly easily possible across multiple games, even multiple blockchains. What's more, the secondary market is very active and is witnessing significant investments throughout the last two years.

Reusability is only really possible now, with players in control, as the assets they have in one game, can be reused in all compatible platforms.

User generated content (UGC) got a whole new meaning, because with unchallenged ownership, it is truly user's. All the player's effort that was put into creating a particular in-game asset, is preserved and durable, opening up opportunities for new interactions, new markets, and satisfaction of creating something more substantial than a sand castle.

Earning - when playing and from trading. While blockchain is not groundbreaking in this regard, it transcends the currency limits of what were previously isolated game environments. No more collecting just silly points or diamonds or whatnot. Though points, they are at every step. Furthermore, there is now a new market dynamic, where game valuables can be sold within a game or within the blockchain realm, but they could also be traded or mixed with goods and services from the physical world, whereby the physical items are tokenized and thus accessible within a game.

New marketing channels are becoming a lucrative proposition, as the metaverses unlock whole new worlds, with no saturation and blue ocean opportunities. As omnipresent as advertising is, one can easily expect things like influencers posing in virtual worlds, too.

Transparent usage of game assets gives users more insight into the game dynamics, e.g. how rare an item really is, and the operational transparency of the game should yield a fairer playfield, as malicious actions from neither the players nor the operators can't be hidden. However, there are limits to how much insight into the operations there can be due to the fact that only a part of the game logic is (and can ever be) on blockchain.

Decentralized governance might not be deemed advantageous to everyone and is also not on the roadmap of many blockchain games, however all the reasons for it that hold outside of the gaming ecosystem, hold within it, too, such as uniform access, additionally the element of fun and entertainment is emphasized even more.

Testing economic models in real life and on a large scale with minimal cost has significant ramifications for our longer-term future, admitting also that it is not the first consideration of world leaders. The economy in games has been substantial for many years, only now it is not restricted to just play money.

An asset can be a part of one game or multiple games on one platform or on one game on multiple platforms (a.k.a. *multiverse items*). Understanding the implications of this makes one appreciate the power creation of unique digital objects - that is, digital items that cannot be copied or stolen. More specifically, while NFTs can be copied (they are just a bunch of bits), each of them has an owner who is the only operator that can use them, e.g. in a game or trade them on an exchange.

Disadvantages

Besides the obvious challenges that any blockchain project has, there are some that make gaming in particular harder.

- Unpredictable usage costs, which include not only the gas for interacting with smart contracts, but also all connected fees for: storage, exchange of tokens, oracle services, DID providers, relayers and so on.
- Unpredictable network congestion means that players may experience unexpected lags.
- Poor UX (user experience) comes standard with blockchain and the only improvements currently available are on account of relaxing the security of key management. Essentially, the security design of blockchain networks is about peer verification (which can be, and often is, delegated to node-as-a-service providers), where the core part of it is peers doing cryptographic transactions with their private keys. We know how bad is the situation with passwords, with private keys it is at least

as bad. With regards to gaming, it seems contradictory to expect serious security measures from users that just want to have fun.

- Complexity of the technical solution, which is also adding friction to the UX, due to the insufficient performance of Ethereum mainnet, so developers must resort to use additional layers on top, such as sidechains and multiple partitions.
- Finality can be tricky. I might think I've achieved a new level in the game, only to discover a few seconds later that my already confirmed blockchain transaction doesn't (yet) count, because the blockchain's tip reorganized.
- Unwanted content, such as spam or worse, comes with blockchain's censorship-resistance. Even though there are several mitigations trialed by several projects, for example curated registries, security deposits and various arbitration designs, blockchains still lack what social norms bring to the freedom of expression in the physical world.

Illicit content, or any content that is upsetting, might just as well be unavoidable, though the small community is currently managing the situation in a friendly manner. See for example the case in Cryptovoxels in May 2020, where a person erected a wall to block a neighbour's sea view and demanded 0.1 ETH/day for it to be removed (<https://decrypt.co/28781/a-bizarre-ransom-was-just-resolved-in-the-metaverse>). The wall eventually went down and the virtual neighbours put their lawn chairs next to each other, but it's a fact that a percentage of people generally act in spite and don't cooperate, so what do you do then.

This being a nascent field, we have plenty of challenges to overcome, but there is comfort in the sheer number of people working on solving them in a true spirit of permissionless innovation, just try to follow this space - it has been overwhelming for a decade already and going strong. The solutions are sometimes absolutely fantastic.

How it works

Even though blockchain games run some parts of their logic on a blockchain, their aspirations are seldom to be progressively more decentralized. Reasons are not just business-oriented, there are also technological constraints of how much a blockchain can take.

Some projects go as far as building their own specialized blockchain (e.g. Flow, see:

<https://medium.com/dapperlabs/introducing-flow-a-new-blockchain-from-the-creators-of-cryptokitties-d291282732f5>), or are using other scalability approaches, such as layer-2 designs (e.g. various projects using Plasma, see: <https://blockonomi.com/layer-2-scaling-matic-loom/>), or are optimizing the

use of layer-1 blockchain networks to extremely high degrees (e.g. Gods Unchained, see: <https://blog.godsunchained.com/2019/04/28/1-million-nfts-isnt-cool/>).

Essentially, there are a couple of components in a blockchain game:

1. centralized server side used for the majority of logic, rendering, caching, etc., usually run by the company that develops the game;
2. decentralized side for the game assets, such as characters, cards, scores etc., it consists of:
 - code on a blockchain, called smart contracts on Ethereum and predicates on Bitcoin, that store value and logic, and
 - a separate storage layer to store the images and other asset metadata that would otherwise be too costly to store on-chain;
3. front-end clients that players use to play the game and manage their blockchain assets, including:
 - clients of all shapes and sizes: mobile, desktop, web, sometimes supporting also a full VR experience;
 - blockchain wallet, that manages the interactions with the blockchain, thus is a critical part of the stack;
 - optionally, a key management solution that secures private keys in a hardware device (e.g. Ledger) or is using a third party provider (e.g. Trustology).

Existing research











Blockchain gaming has attracted researchers more so in recent years, supposedly as the technology becomes more accessible and scalable. Here is a list of recent papers that are available publicly.

- Blockchain Games: A Survey [Tian Min, Hanyi Wang, Yaoze Guo, Wei Cai, 2019]; <https://arxiv.org/abs/1906.05558>
- A Security Case Study for Blockchain Games [Tian Min, Wei Cai, 2019]; <https://arxiv.org/pdf/1906.05538.pdf>
- CryptoKitties and the New Ludic Economy: How Blockchain Introduces Value, Ownership, and Scarcity in Digital Gaming [Alesja Serada, Tanja Sihvonen, J. Tuomas Harviainen, 2020]; http://www.digra.org/wp-content/uploads/digital-library/DiGRA_2019_paper_103.pdf

Statistics

NonFungible.com shows that the most volume in USD is taken by virtual world games Decentraland and Cryptovoxels. With many well-funded games going live in 2020, it will be a space to watch for. Platforms are competing on expensive trades and where do virtual citizens go to party.

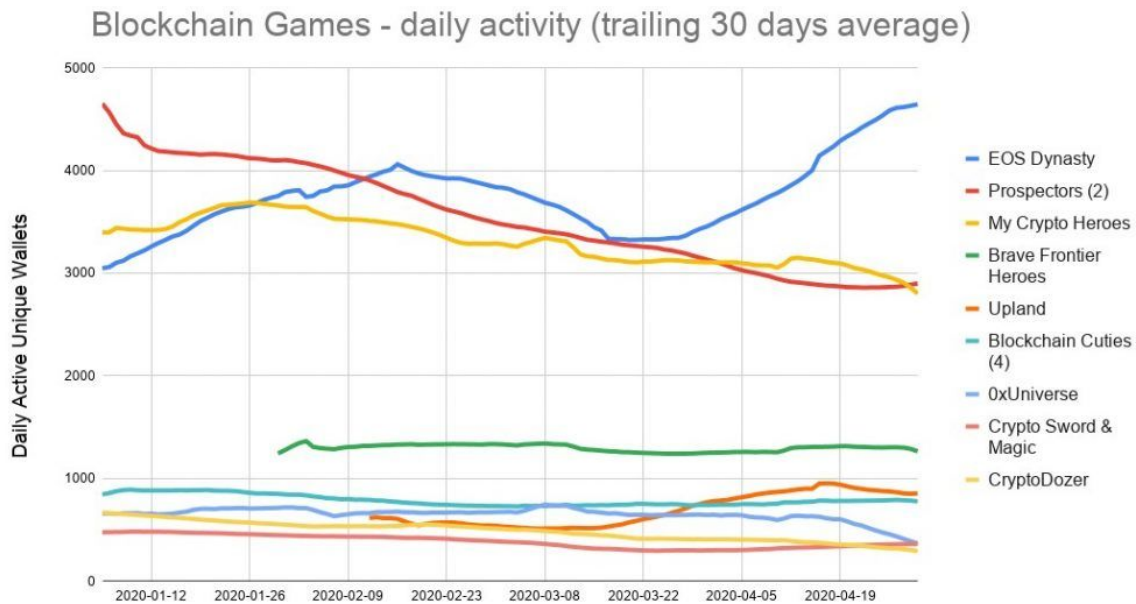
Source: <https://nonfungible.com/market/history>

#	Name	Volume 7d (USD)	Last 7d sales	Average price 7d (USD)
1	 DECENTRALAND	\$118,372.57	213	\$555.74
2	 CRYPTOVOXELS	\$48,424.81	85	\$569.7
3	 CRYPTOKITTIES	\$20,294.79	10,613	\$1.91
4	 CRYPTO SPACE COMMANDER	\$15,557.15	277	\$56.16
5	 MYCRYPTOHEROES	\$15,111.41	221	\$68.38
6	 SUPERRARE	\$14,033.42	126	\$111.38
7	 GODS UNCHAINED	\$10,297.66	12,280	\$0.84
8	 MAKERSPLACE	\$9,554.95	130	\$73.5
9	 AXIE INFINITY	\$7,037.17	1,487	\$4.73
10	 THE SANDBOX	\$4,682.32	88	\$53.21

A report from BlockchainGamer.biz gives an insight into the numbers of users that are active gamers. It is still very niche, but that doesn't mean that in-game assets can't be traded for large amounts of money - some are willing to pay thousands USD for the right assets.












Source:

<https://www.blockchaingamer.biz/features/13002/most-popular-blockchain-games-2/>












A long-standing website DappRadar shows these statistics at the beginning of Q2 2020, revealing the fact that, come to gaming, Ethereum has strong competition, as security and the level of decentralization can be relaxed:

Source: <https://dappradar.com/rankings/category/games>

	CATEGORY	PROTOCOL	BALANCE	USERS	VOLUME	TXS	
Ad	 OxRacers	Games	NEO	216.21	0	\$0	0
1	 EOS Dynasty	Games	EOS	11.5k	4.6k -3.57%	\$2.4k	117.3k
2	 PROSPECTORS	Games	WAX	2k	1.7k -2.25%	\$0	23.3k
3	 PROSPECTORS	Games	EOS	10.8	1.3k -3.02%	\$0	14.6k
4	 BRAVE FRONTIE...	Games	ETH	157.13	1.2k +0.34%	\$1.6k	1.6k
5	 Upland	Games	EOS	2.4k	900 -6.54%	\$0	2.6k
6	 Blockchain Cuties	Games	ETH	368.99	517 -1.34%	\$130	611
7	 XPET	Games	EOS	0.12	450 -0.66%	\$244	1.3k
8	 My Crypto Heroes	Games	ETH	148.98	390 -57.84%	\$531	722
9	 Crypto Sword & M...	Games	EOS	619.34	356 -13.17%	\$178	629
10	 WAXTycoon	Games	WAX	641.78	342 -4.20%	\$0	29.5k

A popular website “State of the DApps” has a ranked list of dapps, including games. The stats at the beginning of Q2 2020 look like the screenshot below. Note that some numbers feel a bit odd and much too low.

Source: <https://www.stateofthedapps.com/rankings/category/games>

# ?	Platform	Category	Users (24h) ?	Volume (7d) ?
13 ▲8	 EOS Dynasty Three kingdoms RPG and PvP game	EOS	Games 4,491 -0.97%	17,231 EOS 47,110 USD -37.11%
1	 Splinterlands The next generation of collectible card games!	Steem	Games 4,199 -1.39%	100,941 STEEM 19,270 USD +15.13%
41 ▲1	 Brave Frontier Heroes Brave Frontier turns into blockchain game	Ethereum	Games 1,250 +2.63%	54 ETH 10,634 USD -11.77%
19	 Prospectors Multiplayer online real time economic strategy	EOS	Games 1,195 -0.91%	0 EOS 0 USD -100.00%
30 ▲1	 Upland Property trading game with real-world addresses	EOS	Games 920 +2.79%	0 EOS 0 USD -100.00%
38 ▼1	 Blockchain Cuties Cutest collectible adventure game with NFT Pets	Ethereum	Games 529 +0.38%	10 ETH 2,187 USD -32.79%
112 ▲14	 Enjin Coin Smart cryptocurrency for gaming	Ethereum	Games 447 -5.89%	0 ETH 0 USD -
66 ▲1	 Crypto Sword and Magic EOS Blockbuster Game	EOS	Games 396 +0.76%	437 EOS 1,196 USD +44.85%
16 ▼4	 My Crypto Heroes Hero worker-placement RPG.	Ethereum	Games 392 -54.73%	8 ETH 1,474 USD +30.43%

Info portals

Information about blockchain gaming ecosystem can be found in many places, from most general that monitor all dapps, like DappRadar, to those that monitor NFT contracts specifically, like NonFungible.com, to gaming portals such as these below.

Blockchain Game Alliance has been operating since September 2018 and includes members from almost all game development companies in this space.

<https://blockchaingamealliance.org/bga-company-directory-2/>

Their mission: “Raise individual and businesses awareness about how blockchain can transform games and improve or disrupt existing business areas.”

BlockchainGamer is a quite lively news portal for blockchain games, operating via STEEL MEDIA LTD, a company that has been covering gaming news since 2005, later also adding the blockchain space.

<https://www.blockchaingamer.biz/>

Multiverse 101 is operating since 2019 with useful information and news especially interesting for multiverse fans.

<https://multiverse101.com/>

Development companies

Blockchain gaming companies come in all shapes and sizes, some with good traction are one-man bands, while others have millions in funding. The origin of funds is also well spread between VC investments and ICOs. There are very few gaming companies in Europe, as it seems that Asia and the USA are leading the space.

There has been some consolidation in recent years, see for example Animoca Brands absorbing others, and there isn't any shortage of drama, too, take Loom for example, who are pivoting to an enterprise environment suddenly and completely (see the explanatory post from Loom <https://medium.com/loom-network/basechain-a-one-year-retrospective-c0e11f23ac0>), which doesn't sit well for many users who are now migrating to alternative networks like Matic, e.g. Somnium Space (see <https://blog.matic.network/vr-platform-somnium-space-partners-with-matic-network-launches-road-to-secondary-land-offering/>) and Axie Infinity (see <https://axie.substack.com/p/axie-loom-validator-shut-down>).

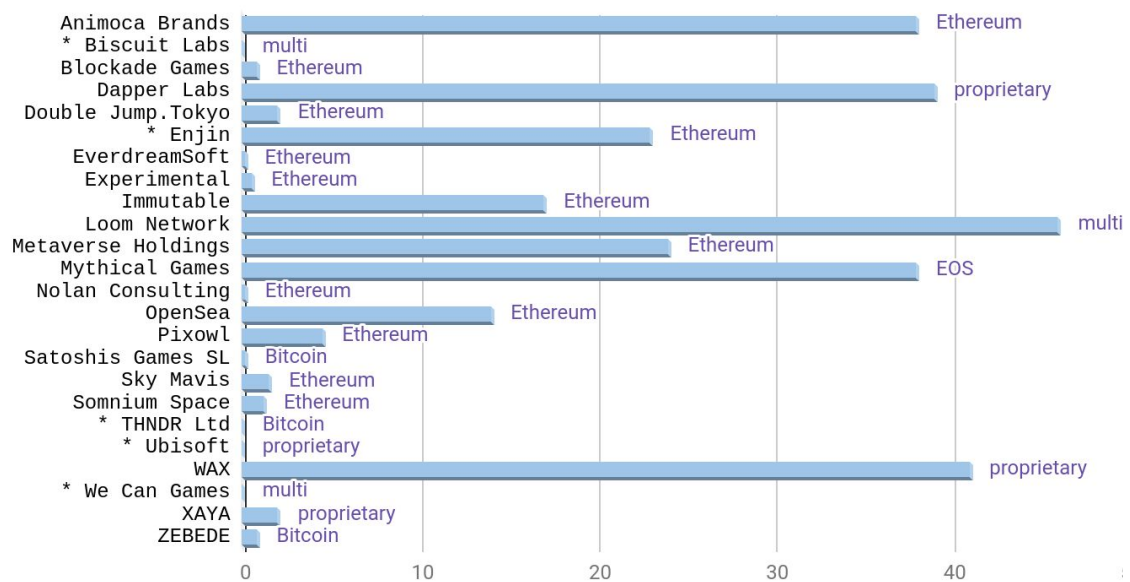
Some games have even given up on blockchain, e.g. CryptoWars who went off-chain completely and is integrating cryptocurrencies only for payments, see:

<https://www.coindesk.com/cryptowars-leaves-loom-sidechain-in-pivot-to-play-to-earn-aka-betting>.

The most activities are happening on Ethereum network, though others are not far behind, esp. EOS. Very recently, Bitcoin ecosystem is stepping up the game, for example leveraging Lightning Network for the issuance of NFTs: <https://blog.lightnrite.io/nfts/>

The allocation of investments reveals an interesting picture, though some popular companies did not reveal their funding publicly yet.

Investments (\$ mln; * private)



Company	Country	Funding \$	Known for	Platform
Animoca Brands	Hong Kong	2011/18/19 38m	Bought Pixowl & others; partnered with Dapper Labs, Decentraland, OpenSea, Sky Mavis, Atari & others	Ethereum
Biscuit Labs	South Korea	2019 ?	EOS Knights	EOS, TRON
Blockade Games	USA	2018 0.8m	Neon District	Ethereum, Loom, Matic*
Dapper Labs	Canada	2017/18/19 39m	CryptoKitties Cheeze Wizards	Flow (proprietary)
Double Jump.Tokyo	Japan	2014/18/19 2m	My Crypto Heroes	Loom*
Enjin	Singapore	2009, blockchain 2017 ICO 23m, 2019 VC ?	Wallet integrated in Samsung S10	Ethereum

EverdreamSoft	Switzerland	2010, blockchain 2017 0.14m	Spells of Genesis	Ethereum, Matic
Experimental	Argentina	2018/19 0.5m	CryptoWars	Ethereum
Immutable	Australia	2018/19 17m	Gods Unchained	Ethereum, Immutable X
Loom Network	South Korea	2017/18 ICO 46m	Zombie Battleground; initially funded 0.3m via Kickstart; LOOM token on multiple blockchains; now pivoting to enterprise	Loom, bridges to Bitcoin, Ethereum, Binance Chain, Tron
Metaverse Holdings	Caymans	2017 ICO 24m	Decentraland	Ethereum
Mythical Games	USA	2018/19 38m	Blankos; Created NFT standard dGoods	EOS
Nolan Consulting	New Zealand	2018 0.15m	Cryptovoxels	Ethereum
OpenSea	USA	2017/18/19 4m	NFT marketplace	Ethereum
Pixowl	USA	2011/12/14/18/19 4.5m	The Sandbox; bought by Animoca Brands; raised via company TSB Gaming	Ethereum
Satoshis Games SL	USA	2019 VC 0.25m	LightNite, Agar, The Legend of Satoshi, operating on Liquid, Elixir gaming platform	Bitcoin - Lightning
Sky Mavis	Vietnam	2019 1.5m	Axie Infinity	Ethereum, Loom*
Somnium Space	UK	2018/19 0.2m crowdfunding, 1m seed	Somnium Space	Ethereum
THNDR Ltd	UK	?	Bitcoin Bounce - mobile game with payments on Lightning Network	Bitcoin
Ubisoft	France	?	traditional games, feeling the blockchain ecosystem for a while	Ultra (proprietary)
WAX	USA/ Caymans	2017 ICO 41m	Founded by OPSkins team, popular with gaming items marketplace; class-action lawsuit 2019 bad ICO	EOS compatible
We Can Games	Latvia	?	Blockchain Cuties; multi-blockchain	Ethereum, EOS, TRON, NEO
XAYA	Malta	2017 ICO 2m	Focus on decentralization	XAYA (proprietary)
ZEBEDE	USA	2019 0.8m	Bitcoin Lightning Network platform for game payments	Bitcoin

As with most everything blockchain, even if a project aspires to be decentralized, it is operated by a company in the physical world. At least for the time being.

AR/VR, digital twins

I vaguely remember the presentation of Microsoft Surface many years ago. Then there was the movie *Minority Report* with Tom Cruise controlling some information system by waving his hands in the air. Augmented reality should start to take off in combination with metaverses, because an item's physical manifestation is on-par with its digital twin in a virtual world - in all aspects, from the look, value and ownership, but for the physical contact. Two projects are remarkable in what they have already accomplished.

RTFKT x WAX - An AR Demo of Sneakers Trading on WAX Marketplace.

<https://youtu.be/YZSDpOcJIXg>



BlockV are creating and dropping objects on blockchain, to be discovered in real life through AR. Amazing designs.

<https://www.blockv.io/vatoms/>



Digi-physical apparel

An interesting phenomenon occurred on blockchain - features that were once unique in the blockchain space, are being mimicked in the physical world, literally. Uniqueness that is praised so highly with NFTs is not common in the physical world: imagine how unique are the clothes that you are wearing at the moment, they're not really unique and can be easily swapped with different items of the same design. On the contrary, each NFT has a unique identifier, so while one can swap different NFTs that have the same metadata, everybody would know that that exact swap has been made - and that could be important in some cases. For example, two same-looking t-shirts, of same fabric, size, lot number and with the same monster image, might have different prices, if one of them was known to be worn by a popstar.

There are two approaches to uniqueness in the physical world: either put an identifying chip on each physical item, or produce only a limited amount (as low as one, even) of same-looking items. Both options have unresolved issues, the limited edition items require trusting that the limit will be honored (how to verify?); while with physically chipping physical items we can at least get better guarantees and can use the identifiers in all digital systems, including in blockchain gaming, despite it costing more and being subject to the quality and honesty of chipping itself.

Trading is well established in both worlds, but only separately. If one were to trade a physical item within a metaverse, it is a challenge of trust and there are pioneering projects working on bridging these two worlds, such as <https://bosonprotocol.io/>.

The importance of data that is generated, and then wasted and lost, through the life cycle of physical items, is clearly described in Vinay Gupta's post about Mattereum's wider context (see <https://medium.com/humanizing-the-singularity/how-post-industrial-capitalism-and-a-new-type-of-big-data-will-save-the-planet-6574b1d75bf6>) and pertains to the gaming paraphernalia especially well.

Unisocks

The blockchain-rooted clothes started with socks. Unisocks. Exactly a year ago, in May 2019, one of the more clever projects on Ethereum, called Uniswap, which is an automated, fully on-chain, decentralized exchange, announced an offering for a limited amount of 500 branded socks. In line with their normal dynamic pricing, the socks are using a bonding curve as well. See this fascinating article about the story:

<https://medium.com/frst/money-laundry-the-rise-of-the-crypto-sock-market-f979aafc3796>

The socks are available at <https://unisocks.exchange/> - the price in the beginning of May 2020 was \$125, with 101 out of 500 available socks already redeemed.

Blockchain- and real-world are counter-mimicking in some most unexpected ways. After Unisocks changed their design even minimally, the first socks offering forked into Unisocks Classic, which preserved the original design: <https://thedefiant.substack.com/p/fashion-faux-pas-leads-to-unisocks>

MetaFactory

When it comes to brands that promote both decentralization and the duality of physical-virtual presence, MetaFactory is pushing the imagination of what is possible with community-managed brands. It is very attractive and has a lively community. Currently, they are experimenting with a project selling 42 bomber jackets. On one hand, they have unique chips embedded on physical items, and on the other hand, digital items are represented as NFTs. The bomber jackets are wearable also in CryptoVoxels and Sandbox.

MetaFactory is governed by a DAO, coincidentally they also got the initial funding through Metacartel. Read more about MetaFactory here: <https://medium.com/@themetafactory/metafactory-rearchitcting-culture-for-the-digital-metaverse-df2693b7ec3b>

Zora

They started community branding with an example of 100 shirts, again with a specific price curve. Curiously, the shirts were selling for \$250 even before the design was set.

<https://www.ourzora.com/introducing-zora>

Most popular games

Can we pause and think about the fact that we have made extraordinary complex technology and launched it into space for the purpose of transmitting TV signals. We, people, create a substantial demand for the corporations to produce soap-operas and watch always-breaking-news, we demand entertainment. We build satellites to get entertainment. In the post-covid19 world, one can easily conclude that entertainment in a digital form will permeate our lives significantly more. We become wary of people being close

together, we work remotely, we date online, we furiously type-and-swipe-and-tap on our phones ... human touch and basic human interactions are transforming. We are creating more complex technologies to entertain us more.

A yearly report from NonFungible.com revealed that the most popular game categories in 2019 were (ordered): collectibles, strategy, RPG. Metaverse games were ranked the lowest in terms of transaction volume, though fared better in terms of value exchanged - which could be explained by the nascent space, which got significant investments in 2019 and got developers busy, therefore it can be expected that the numbers for 2020 will be quite different. Noteworthy is also mentioning that metaverse games themselves present a venue for the trading of collectibles, art, strategy and other activities as well.

Virtual worlds FTW!

Virtual worlds are also called *metaverses* - which is a much better word than the overused term virtual, as it is not just virtual if there's real economy with linkage to fiat, digi-physical twins etc.

The entertainment industry often drives technology to progress ever faster, but not all is about just fun. During the 2020 coronavirus crisis, 12% of Finland's population gathered in a VR Helsinki on a virtual concert, which included the participation and speech by the mayor: <https://www.businessinsider.com/finland-virtual-reality-concert-may-day-during-the-coronavirus-2020-5>.

Interesting reading:

<https://ryanschultz.com/category/blockchain-based-virtual-worlds/>

There are a few quite special virtual worlds, let's describe some of them. Interestingly all these are operating on Ethereum and fully support VR.

Decentraland

- Raised \$24m in 35 seconds in 2017 ICO.
- Metaverse Holdings Ltd., registered in the Cayman Islands.
- Assets: land (parcels, 3D models of items, scenes etc) and avatar wearables.
- Less in-game activities, but there is much more trading of assets and user accounts and discussions.
- MANA is the internal ERC20 cryptocurrency, LAND are parcel non-fungible ERC721 tokens (coordinates, owner, pointer to metadata).
- Average land price: \$550; 10 sales/day; about 5000 users.
- Runs within a browser.

PC Gamer, March 2020, detailed description of the game: <https://www.pcgamer.com/inside-decentraland-the-surreal-second-life-for-crypto-true-believers/>

The Movement, December 2018, describing the negative experience early on: <https://medium.com/@MovementDAO/parting-with-de-centraland-bdaad081f2f7>

CryptoVoxels

- Raised ~\$0.15m in 2018.
- Funded and developed by Ben Nolan from New Zealand, who previously worked for Decentraland, another developer joined in January 2020.
- A voxel is a volumetric pixel.
- CryptoVoxels looks like Minecraft and feels like Facebook, yet there is also a place for trading and creativity.
- COLR is the internal cryptocurrency, parcels are ERC721 tokens.
- Average land price: \$550; 30 sales/day; largest sale 500 ETH; about 500 users.
- Appreciated esp. by crypto-artists to display their NFT art in a gallery of voxels.
- Runs within a browser.

A comprehensive review by Andrew Steinwold, February 2020: <https://andrewsteinwold.substack.com/p/cryptovoxels-investment-thoughts>

Somnium Space

- Raised \$150k crowdfunding via SeedingVR (no longer operating) in 2018 and \$55k crowdfunding via Indiegogo in 2019 selling parcels, then \$1m seed in 2019.
- Besides players owning the assets, the game is centralized: “We love decentralized and we love privacy, but a project of our size and vision needs to be curated and decisions have to be made quickly towards our vision, hence centralized.” (<https://somniaespace.com/terms-conditions/faq>)
- Somnium 2.0 launched in February 2020.
- CUBE is the internal cryptocurrency, parcels are ERC721x tokens (<https://erc721x.org/>, designed by Loom Network).
- Average land price: ~\$500; ~10 sales/day; about 250 users total.
- Windows only.

Somnium Space as a new conferencing environment, March 2020:

<https://somniaetimes.com/2020/03/12/how-somnia-space-can-transform-your-business-meetings-and-conferences/>

There are more trending virtual worlds, each special in its own way and worthy of exploration of their origin story:

- on Ethereum: Age of Rust, MegaCryptoPolis, One Game Valireum (ex. Districts), The Sandbox
- on EOS: Blankos, Upland
- on XAYA: HunterCoin
- using Bitcoin, now deprecated: BitQuest

Other games

Card games are at the top of blockchain gaming, perhaps pointing to low hanging fruit development. Nevertheless, what Gods Unchained managed to achieve in terms of user adoption and transaction throughput, is remarkable. Their early wizardry is described here: <https://blog.godsunchained.com/2019/04/28/1-million-nfts-isnt-cool/>, and their latest, ultimate design in terms of scalability required, is described here: <https://medium.com/@immutable/introducing-immutable-x-2a27d8502150>.

RPGs and arcades are popular across many blockchain networks. Strategy games interestingly have similar names and include even a game on Bitcoin SV. Esports, gambling etc. belong to a different ecosystem altogether and mostly leverage blockchain for payments.

<p><u>Card games, a.k.a. TCG:</u></p> <ul style="list-style-type: none"> ● Gods Unchained - Ethereum ● Mythereum - Ethereum ● SkyWeaver - Ethereum ● Spells of Genesis - Ethereum ● Splinterlands - Steem 	<p><u>RPG, arcade, other:</u></p> <ul style="list-style-type: none"> ● Axie Infinity - Ethereum ● Blockchain Cuties - Ethereum, EOS, Tron, NEO ● EOS Knight - EOS ● Ethermon - Ethereum ● Forgotten Artifacts - Ethereum ● Neon District - Ethereum ● Prospectors - EOS, WAX ● The Six Dragons - Ethereum
<p><u>Strategy games:</u></p> <ul style="list-style-type: none"> ● OxUniverse - Ethereum ● Crypto Assault - Ethereum ● CryptoFights - Bitcoin SV ● CryptoWars - off-chain 	<p><u>Esports:</u></p> <ul style="list-style-type: none"> ● DreamTeam - Ethereum ● First Blood - Cosmos ● Sorare - Ethereum ● Unikoin Gold - Ethereum

Open questions

Some of these still bug me and I might explore them at one point.

1. In what capacity can the community contribute to the development?
2. What parts are open-source across various games and how is the weakest link affecting the overall security over the blockchain assets?
3. What business models are leading the ecosystem?