



Blockchain Technologies and Games: A Proper Match?

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ABSTRACT

Not only have virtual currencies in digital games from the pre-Blockchain era helped to understand digital currency systems, but the idea that digital objects can have monetary value is a question of faith that has been expressed primarily through the gaming industry. In the world of business this is now called the 'token economy'. Blockchain as a technology can do much more, besides payment processing with cryptocurrencies, utility tokens can be created to secure in-game currencies and items, gamification systems can be made more transparent while strengthening the privacy of the players and even whole game ecosystems can be secured by Blockchain. However, this is still a very young technology and that there is a certain technological war of faith as well as a big area of scams around and with Blockchain-based systems and tokens. In this paper we will present a bird's eye view, based on results of the expert interviews, of how Blockchain as technology is connected to the different aspects of games and play.

CCS CONCEPTS

• **Computing methodologies** → **Distributed computing methodologies**.

KEYWORDS

Blockchain, digital games, serious games, gamification

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1 INTRODUCTION

Modern digital computer games have two areas for which Blockchain technologies could have an area of use: The representation of property in the form of digital items and virtual currencies (wealth) and the trading of these valuables.

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The work of Rüdiger et al. [7, 16] show that these digital values create enormous value in real currency systems through legal (as well as illegal) channels. Illegal activities in particular need to be addressed, especially for the protection of players.

In this short paper, we investigate the following research questions based on an expert interviews: What applications for Blockchain technologies could exist looking at the "extended" digital games industry? And what are the strengths, weaknesses and difficulties of using Blockchain technologies in this sector for the near future? Since the connection between Blockchain as a future technology and the gaming sector is not yet widely known, this paper helps the community to get an overview of the possible applications.

2 RELATED WORK

Min et al. [10] discussed the Blockchain integration for games and then categorize existing Blockchain games from the aspects of their genres and technical platforms.

Chen [3] observed Blockchain technology as an innovative element of the virtual items trading platform. He concludes that the biggest impact of Blockchain technology in the short term is the redistribution and integration of the game and trading platform markets.

Aini et al. [1] explore the role of Gamification approaches which embed Blockchain technologies for the educational sector. Lee et al. [8] examine the effects of speculative and enjoyable aspects on users' playing behavior in Blockchain-based collectible games.

Kraft [6] explores the problem of generating fair randomness in a deterministic, multi-agent context (for instance, a decentralized game built on a Blockchain). He states that the existing state-of-the-art approaches are either susceptible to manipulation if the stakes are high enough, or they are not generally applicable. Therefore he introduces a new approach based on game theory.

Komiya et al. [5] examine consensus algorithms as reward system. They introduce their approach "Proof-of-Achievement (PoA)" which is an algorithm optimized for Blockchain games, focusing on the number of tasks achieved in the game. The aim of using the PoA algorithm is to increase the motivation for playing Blockchain games.

Similar to Komiya, Yuen et al. [21] also perceive consensus algorithms like Proof of Work "PoW" as a bottleneck for games. Their proposal is called "Proof-of-Play" with a focus on P2P Games.

Cai et al. [2] developed two different prototypes to research the aspect of multi-chain as well as multi-game approaches with the aim to create an interoperable Blockchain gaming framework.

3 METHODOLOGY

The method chosen to answer those questions was the problem-centered interview following Witzel [20], which allows a certain freedom in the conversation despite a theory-based formulation of the questions. The answers to the questions were evaluated using the approach of qualitative content analysis according to Mayring [9]. 23 experts from various disciplines (including game designers, game publishers, game researchers, game developers, economists, technology researchers, journalists) were interviewed. The interviews are part of a larger research project on the topic of ‘approaching the ludic society’ [11]. For this short paper, the question of the link between Blockchain technologies and gaming was re-evaluated and specific questions were sent to some interviewees by e-mail regarding changes in the original opinion from 2018 and the state of affairs at the end of 2019.

4 RESULTS AND DISCUSSION

In the following we will shortly discuss our findings of the qualitative content analysis regarding game-related areas that were associated with Blockchain technologies.

4.1 Collectibles (Collection Games)

Collecting in its purest form is not to be seen as a game, unless the collector himself perceives it as a game. Collecting - as mechanic - is however very common within games and digital games. Collectable items range from things that are in plentiful supply, which usually only need to be collected to complete a quest or to gain XP, up to things that are of value to oneself and others. This value can simply be nostalgic, or it can actually be expressed in monetary terms. For both aspects it is important to have the feeling to own the item. Although this feeling is a subjective one in current digital games, it is objectively not true, because the digital items are always owned by the game manufacturer and are part of the game code, which is stored on the central server of the manufacturer. If the item really has a monetary value, one should not forget the fact that the manufacturer can at any time manipulate the type of item, the quantity of the item, the distribution of the item etc. at the push of a button, and can even simply take the item away from the player. Important features for collectors such as protection against forgery, non-tampering etc. are therefore not given in most current digital games, where collecting is an essential mechanics, as well as in pure digital collecting games.

An excellent example of a successful collecting game based on Blockchain technologies (in this case the Blockchain Ethereum, Code available on Git-Hub) is Cryptokitties. Cryptokitties have already been exchanged millions of times and individual special cats have been traded in the six-figure dollar range. Another specialty is The KittyVerse, these are games and applications where you can use your own cats. Applications of The KittyVerse are not only developed by the Cryptokitties producer but also by third developer studies and this shows the special potential of virtual objects/assets on Blockchain basis. The possession is with the player and the asset can be used for other games or applications. Ideally, it should also be easy for the user to operate a Blockchain node, then ownership is guaranteed because you are also a part of the respective ledger.

Another example worth to mention is CrypticLegends (on the Ethereum Blockchain). Currently, a hero simulator is being developed based on the idea that the game characters can be used in many different game genres that take place in the CrypticLegends universe. There are also no limits to the imagination for cross-over ideas. CrypticLegends is planning, for example, that the possession of a certain hero or item in a game from another manufacturer will unlock an item or function. For instance, a skin.

Also mentioned in the interviews was Tarasca DOA, a card game in a fantasy world which stands out especially by the beautiful drawings of the playing cards. Since January 2020 the game can be tested in a setting where 8 people are sitting around a virtual gaming table. This game uses the Ardor Blockchain (Ignis Childchain).

In fact, there are many Blockchain based collection games in development, besides cloning the original Cryptokitties idea, or more creative approaches like the described CrypticLegends or Tarasca DOA, there are also collection games specifically designed for the adult market.

4.2 Online Role Playing Games

Popular massively multiplayer online role-playing games (MMORPGs) have a color structure that shows the value of items. This looks like the following in World of Warcraft: Grey is used to color useless items, white is used for ingredients with little value - but useful for making items or potions, green is used for items with less magic (often quest items or items used to disenchant them), purple is used for epic items, and orange is used for items that are legendary and almost unique. Players are familiar with this system and can estimate the value of items by the color combined with the required LVL of the character the item is intended for. World of Warcraft and Diablo, specifically, have introduced another mechanism, the distinction between soulbound and non-soulbound items. For example, when you complete a quest or use an item for the first time, it becomes attached to your character and cannot be exchanged. So why would a Blockchain component be added to an obviously working system that is well known to players worldwide? Why should Blockchain be considered for future developments? And what could a token structure for an MMORPG look like?

There are many reasons, the three most mentioned are to restrict game crime, enable a peer2peer trade where the publisher receives commissions and use items (like armor or weapons) cross-game worlds. Regarding Game Crime: In practice, if an account is stolen and the items are sold, they will be restored to their original owners. People who bought the stolen item will also have a copy of the item. This can lead to problems with the economy of a server, mainly with high level epic items, but especially with legendary items. The current system can also encourage people to steal items themselves by using a second account and simulate a hack. The second possible positive aspect is that the black market in goods can also be restricted. Nevertheless, players will be offered the possibility to trade items for more than in-game currency. Theoretically any combination of in-game currency, items and FIAT money or even cryptocurrencies would be possible. Players are on the safe side not to violate any of the terms and conditions and the manufacturer may charge a commission per transaction. This gives the manufacturer an overview of what is being traded and is part of the official

business model and it is therefore a monetization method. The third point discussed is the possibility of using items in different games. So, a player could use the same favorite sword to defeat monsters in WoW and Diablo.

To come back to colors: Grey and white items would be simple database entries, green items (i.e. items that were worth little) could be tokens that can be reproduced - i.e. items where the game publisher can create more tokens of the same kind with the same basic asset ID. Violet (epic) items would be non-reproducible tokens and strictly limited. And orange (legendary) items would be singleton (unique) tokens, each token with its own asset ID and non-reproducible. All operations that are executed with the items via game actions and that are worth logging can be executed via (Lightweight) Smart Contracts. For example, a sword with the value color green is disenchanting. This generates several database entries of ingredients (in white color) that are assigned to the player account and the token representing the sword itself is sent to a Blockchain address where no private key exists, it is actually taken out of the game. (Lightweight) Smart Contracts are also able to handle processes known from League of Legends, such as assembling key fragments into a key that opens a chest, you get a reward, you get a piece of a reward, and so on.

A very interesting approach in regard to player data is an experimental game named Rhythm Dungeon. This game is a Blockchain-based Music Roguelike Game [19] where player data is stored on Blockchain, thus creating an individual profile for each game with its strengths and weaknesses, as well as the possibility to use the character in different games.

4.3 In-Game Currencies

The procedure for in-game currency would be similar to that for tokens, which stand for green items (see above). Most recommendable, according to the interviews, would be reproducible tokens. Non-reproducible tokens only make sense if the amount of money in a game is to be limited (for example for reasons of game mechanics). The advantages would be that tokens can be used in several games. For example, games like Clash of Clans and Clash Royale could share the same tokens, and the player could spend them here or there. If they are not the same tokens, (lightweight) Smart Contracts can ensure that they are exchanged according to the specific FIAT value of the respective token. Another option would be to allow a player to sell to players (again, so that the manufacturer receives a commission), or (more likely) to allow tokens to be returned under certain conditions (for a handling fee).

However, the tokens behind the in-game currency should follow the concept of fixed-price tradable utility tokens. What happens when the in-game currency is priced according to supply and demand and traded on cryptocurrencies exchanges is best illustrated by the example Beyond the Void. First a hyped game, the extreme volatility of the in-game currency to FIAT currency completely destroyed the game mechanics and the game is no longer playable. The token representing the in-game currency (Nexium) is not traded on any stock exchange anymore due to the low volume.

One of the most ambitious projects at the moment is called Lightnite. Lightnite is a Fortnite like game that uses directly Bitcoin, or

better its fractions Satoshis, as in-game currency for micropayments. This is possible because of the 2nd layer solution upon Bitcoin called the lightning network, which can handle transaction basically in real time. This approach is remarkable because it basically introduces Bitcoin as In-Game currency.

4.4 Gamification

A new trend has emerged in gamification over the last few years and there is a great desire among players to find objectivity, transparency (of the game mechanics) and protection of their privacy in combination with successful narration [12]. The integration of Blockchain technologies in a gamification environment can meet these desires, the interviewees agree. The core elements of gamification (points, badges and achievements) can be mapped on a Blockchain basis and their distribution can be registered. This can be done in such a way that the proof of a reward is secured, but still the privacy of the player is protected. The community of players can be sure that no fake-points are distributed and that all actions have been taken correctly.

The biggest advantage, however, is the handling of the prizes or perks you get by using a gamification as a player. This way, different points or even badges can serve to get a prize (as you already know it now), but through a token economy, the redemption process, the payment and the security that no unright vouchers are redeemed can be ensured. This is a big advantage for all parties involved, the players, the game provider and all his partners.

4.5 Serious Games for Learning & Assessment

Blockchain technologies can be used to store learning progress, grades or certificates (cf. [4]). This is of course also possible directly from digital games, which not only teach the content but also save exam results. Thomas et al. [18] and Pfeiffer et al. [13, 14] describe the development of a serious game prototype called "Gallery-Defender" which is a proof of concept that demonstrates how serious games can involve Blockchain technologies in the near future.

4.6 E-Sport

The existing market for e-sports and betting (completely regardless of Blockchain) is shown by Sweeney et al. [17]. The basic willingness to bet on e-sports was also part of a study by Pfeiffer and Wochenalp [15]. In the e-sport sector, two projects were mentioned in the interviews. HeroCoin (from Austria) and FirstBlood (from the USA). HeroCoin was the first Initial Coin Offering (ICO) in Austria and FirstBlood one of the first ICOs in the States. Both products are now in their third year and have had their ups and downs. HeroCoin recently introduced the possibility to place bets directly with Ethereum in addition to their own token. Basically, both products are about initiating competitions against other players and winning tokens. There is also the possibility to play in tournaments, where prizes (mostly digital items like skins for games) are available. Furthermore, the possibility of tokenizing a complete tournament was mentioned in the interviews. The participants as well as the sponsors have to buy a specific tournament token from the organizers. These tokens are then distributed in the tournament and can be exchanged by the participants for non-cash prizes. The tournament

organizer keeps the amount of money that the event has cost in the organization plus an overhead.

4.7 Bets, Gambling & iGaming

The gambling and sports betting industry has also discovered Blockchain technologies for themselves. Use cases here include accepting cryptocurrencies as a means of payment, implementing loyalty programs on Blockchain tokens or verifying slot machines so that players and local operators can be sure that the machine is an original machine and is logged into the provider's network. In the betting sector the platform AUGUR is also worth mentioning, here you can create bets regarding the outcome of future events, or simply place existing betting proposals.

4.8 Building Game Eco-Systems on Blockchain

Pfeiffer and Wernbacher have created a concept how games that are no longer hosted but are loved by the community can be brought back to life in a non-/low profit version¹. In this case, those players who help to make the game available (provide the EXE file for download, replay competition games to prevent cheating) get tokens, which players who just want to play have to buy from the decentralized system (Smart Contract). The clue is that the token pool on the network is in turn filled by the tokens that the game operators have received. Operators either receive a share of the money from the token sale, or they can also use the tokens to play the game or to buy in-game items like skins. This way a system can be created which is completely by players for players. The original publisher can still participate in the system with a server, which ensures that there is always a server online and thereby assists the community.

5 CONCLUSION & OUTLOOK

Blockchain technologies undoubtedly offer enormous potential for the gaming and gamification sector, both for producers and players. However, it is still a long process before established game companies abandon their established processes and start implementing Blockchain technologies. Although Blockchain technologies have been in use for over 10 years, they are, still at an early stage and it is difficult for companies to distinguish which network to rely on. Furthermore, the social acceptance is considered rather low and the spread of Blockchain tokens is not yet mainstream.

There are also many questions to be answered such as: Do the players themselves have to possess 'Tradeable network maintenance utility tokens' to the tokens for pay transaction fees to the network for the gaming-related tokens. Or should technical possibilities such as 'bundling' at Ardor or specific 'smart contracts' for this process on Ethereum be used to take over the fees for the players as publisher. If so, how should this payment be passed on to the customers? How to deal with the tightened know-your-customer (KYC) and anti-money laundering (AML) regulations that an implementation of Blockchain technologies (if the tokens are freely-tradable) requires. Which information in a gaming environment is actually so valuable in the end that it should be stored using Blockchain technologies? And should we initially focus on Private Blockchains, Consortium Blockchains, Public Blockchains

or a reasonable combination of these possibilities? However, one thing is certain: exciting years in research and development await us!

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¹<http://www.frogvienna.at/alexander-pfeiffer-2018/> Accessed: July, 2020