Blockchain for Lotteries

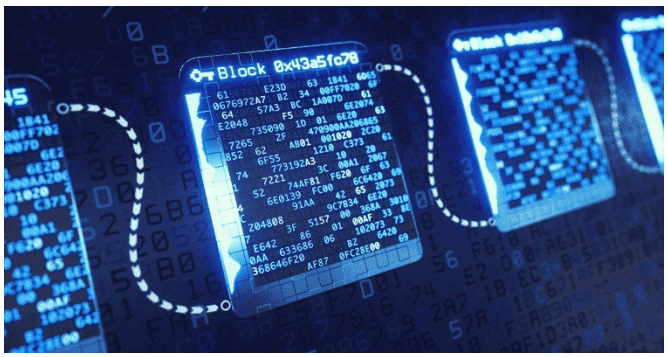
A review of the blockchain technology and an analysis of its application in lottery industry
December 2022

Technological developments and industrial adaptations are leading to a fundamental change in how industries and strategy function in the world today. Disruptive technologies like blockchain, are forcing us to reconsider the way we make decisions, and the models that were previously in place for delivering products and services.

Background

The business models that so many long-standing organizations rely on are being undermined, or completely replaced, through the development of new technologies. This shouldn't come as a surprise; the market for developments such as blockchain is more accessible than ever and developing all the time. The organizations that find themselves able to innovate through digital technology are forging ahead, creating new paradigms, and shifting the way we approach business. Programmable contracts, or smart contracts, which can run without the direct support or intervention of a human being, are able to computerize or replace many existing processes that sometimes are vulnerable to various threats including those originated by humans or are not optimized for cost.

Blockchain is an electronic ledger, or register, holding records, events, and transactions. Blockchain is managed by a shared computer network. The best-known, and undoubtably most publicized, use for blockchain is Bitcoin, however blockchain has a wide range of potential applications aside from cryptocurrency. Blockchain creates an opportunity for making payments without the involvement of a bank or other financial intermediary, potentially making it useful in several financial services including digital assets and online payments.



Source: CORCENTRIC July 2017

There are four environmental factors (political, economic, social, and technical) investigating the point of acceptance of blockchain technology. Here is a look at these factors and their beneficial drivers:

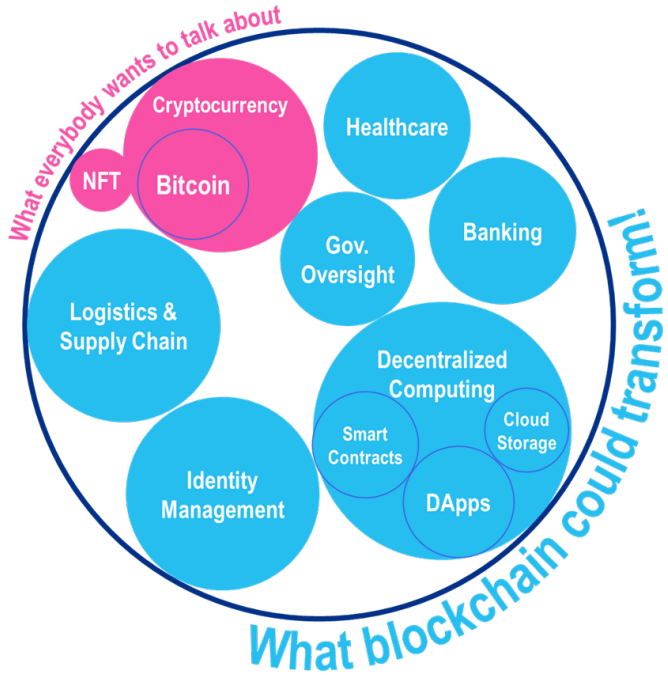
Factor	Benefit
Political	Transparency: public blockchains are viewable by all participants and cannot be altered, allowing trust of transactions without a required regulatory party.
Economic	Costs: blockchain has the ability to automate a number of existing functions and lowers transaction costs and improves completion time by removing the need for third-party intermediary transaction fees.
Social	User Control: ability to monitor transactions in a single location.
Technical	Quality: decentralized reliability, durability and security, no centralized server or single point of failure, greater protection against fraudulent transactions.

Blockchain use cases

Like the internet once did to businesses, blockchain is a paradigm shift that enables entirely new opportunities. Blockchain as the platform enables businesses and organizations with various use cases to help achiving the some of these factors. One of the promintent use case is cryptocurrency and its well-known application called Bitcoin. It is very common among the crowd to think about cryptocurrency and Bitcoin when it comes to blockchain, but that is only one small use case.

Blockchain application in healthcare, banking, logistic and supply chain management, and identity management are just a few examples of how blockchain could enable organizations to transform their business and become more efficient and transparent, while increasing the quality of their information.

The following chart smartly pictures some of these use cases and their share of the technology.



Source: A replica of original work from Kevin Monserrat's LinkedIn

"Even though the initial hype surrounding blockchain applications, and the prolonged blockchain "winter" that followed, are beginning to settle, this is no time to rest on our laurels. IT leaders must prepare for the inevitable blockchain tech "spring" on the horizon, bringing with it core-enabling technologies and significant opportunities for digital business."

-- Gartner Website

Blockchain adoption by industries

Despite occasional hurdles brought on by regulatory or macroeconomic challenges, the adoption of and use cases for cryptocurrencies and blockchain technology are expanding among major international institutions.

According to a survey from business blockchain adoption analytics platform Blockdata released on October 6, 44 out of the top 100 public corporations by market capitalization across six major sectors are actively embracing blockchain in some form.

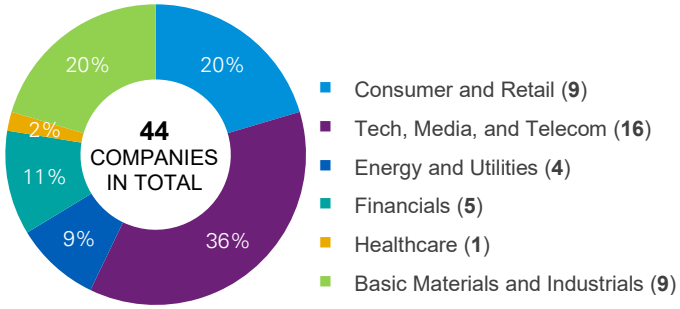
Many of these businesses (36%) are specifically in the technology, media, and telecom industry and include brands like Meta, Salesforce, Adobe, Verizon, and Nvidia.

The consumer and retail (20%) and basic materials and industrials (20%) sectors are next, with UPS, PayPal, Visa, Walmart, McDonald's, and Nike among the participants.

Most IT leaders' businesses will likely be impacted by blockchain technology in the next five years, despite the fact that the environment of this technology can be complicated and is continuously evolving. You can't afford to ignore this potent technology, whether it's because a rival has adopted blockchain technology or because you have to join a blockchain network.

The following chart provides an analysis of these 44 companies and a breakdown of total companies per sector is provided in brackets within the legend.

Sector-wise percentage of companies using blockchain



Source: Blockdata Aug 2021 – Aug 2022

Most of these active institutional users of blockchain technology and cryptocurrency are based in the United States (63%), while 12% have their headquarters in China and Hong Kong.

In addition to financial institutions and banks, other businesses are using blockchain in a variety of applications, such as building consumer loyalty programmes, increasing supply chain transparency, and creating and selling non-fungible assets (NFTs).

For instance, Verizon has integrated a Guardtime-based blockchain platform to serve huge worldwide businesses, while Meta is pushing NFT support for Instagram, Salesforce has launched a restricted trial programme for a solution that allows customers to manage NFTs for marketing and branding.

Also, PayPal customers have the option to buy, store, and sell cryptocurrencies as well as transfer cryptocurrencies from PayPal to third-party wallets. In its payables and receivables processes, Walmart is utilising blockchain to lower the conflicts and reduce the human labour. Finally, Visa has unveiled a line of cards for Latin American nations that support cryptocurrency.

Many businesses have lodged applications for NFT and metaverse related trademarks with the U.S. Patent and Trademark Office (USPTO), adding to the more than 6,000 NFT and blockchain related trademarks in the U.S. filed since January 1, 2022.

The lottery industry

The lottery has been present as one of the most important traditions in the human history, shaping a remarkable role in some of the nation's history.

Blockchain is built on the idea of a trustworthy institution that monitors and secures transactions between various parties, which makes it a major ally of games of chance like the lottery. The blockchain employs an unchangeable database, a copy of which each participant has, making it easier to oversee actions. As a result, participants can reference the blockchain network itself as a single source of truth to confirm the validity of a transaction.

In fact, since the process is totally immune to fraud, the blockchain transforms into a "trust machine", where data is managed securely in terms of its incorruptibility and the origin of its generation. The data can only be stored and used by those who have been granted permission to operate on blockchain.

There are five aspects where blockchain brings value in the lottery context: ownership of the tickets, participation in the draw, the prize collection process, the definition of the

winning numbers and connecting to other businesses in the world of metaverse – a virtual reality enabled by digital goggles which represents the elements of the real world.

Today, the ownership of tickets is managed by physical tickets which is prone to damage or loss, but thanks to tokenization – the digital representation on the blockchain of physical assets – it is now possible to represent and operate with digital tickets in the form of Non-Fungible Token (NFT) and their eventual transfers in a similar way as with traditional tickets to have the same experience as in retail shops.

Blockchain and smart contracts

Blockchain is a whole new technology that works as an incorruptible digital ledger of transactions. There is no need for an external or internal authority: every user relies on the technology itself, following predefined rules to meet the consensus and ensure the integrity and authenticity of the data.

The true value of the blockchain technology comes from the distributed security of the system, making it the most trusted and secure technology there is. A smart contract is an autonomous program that executes based on “if-this-then-that” logic.

Blockchain allows users to create an immutable system for recording any kind of transaction or information. If we apply this to the lottery operation in simple words, it translates into this:

Every time a player picks his numbers and pays for his tickets, the transaction is recorded and can't be modified. It's like a unique piece of code that can never be replicated, modified, or misused.

At the time of the draw, when the winning numbers are declared, the system is designed to compare them against the player's chosen numbers and execute the automatic actions accordingly.

If the predefined conditions are met, each action is going to get executed automatically and instantly: like for example transferring the prize money from the jackpot to the winners if the right conditions were met.

Smart contracts are the key piece that guarantee the automation, security and integrity of the system and they are designed to avoid third-party interventions, manipulation, or any malicious activity.

Differences between blockchain and online solutions

The Internet has improved the convenience, speed and efficiency of transactions while shrinking – and sometimes virtually eliminating – the distance between buyers and sellers. Despite this, within the online gaming space, many transactions remain inefficient, expensive, and vulnerable, suffering from the following limitations:

- The time between transaction and settlement can be long.
- Duplication of effort and the need for third-party validation and/or presence of intermediaries add to inefficiencies.
- Fraud, cyberattacks and even simple mistakes add to the cost and complexity of running entities, exposing all participants in the network to risk if central system – such as game operator – is compromised.
- Limited transparency and inconsistent information.

Blockchain, on the other hand, has the following benefits:

- Time savings: transaction settlement is faster because it doesn't require verification by a central authority, reducing drastically.
- Cost savings; due to less oversight requirements thanks to the network self-policy and elimination of intermediaries.
- Tighter security: Blockchain's security features protects against tampering, fraud, and cybercrime
- Enhanced privacy
- Improved auditability
- Increased operation efficiency

It is a common practice that most of online lotteries require players to create an account on their website and deposit money or their valuable cryptocurrencies before they can play.

To maintain wallets, online lotteries must use a login mechanism to authenticate and authorize access to those wallets to the legitimate users. Hence, a signup process is needed to capture players information and record them in a database for authentication purpose.

This will create many issues, including the potential security flaws in the programming logic of signup and login functions in the application, if not adequately coded with security in design approach. Many applications are the victim of cyber attacks because of simple programming mistakes during the development of these functions, and lack of a comprehensive secure code audit due to its costly and time-consuming process. By avoiding such functions, our solution eliminates the threats related to such components, creating a safer environment for the players. Meanwhile, players can enjoy playing games without going through a painful signup process or having to login to platform to buy their lucky numbers.

Blockchain’s unique advantages over other solutions

Blockchain-based solutions for lotteries have several benefits over other solutions if used correctly and implemented properly. First off, they can be easily accessed by lottery players, and they do not need to provide any personal information just to participate, providing the best of in-store/retail and online experience at the same time.

All listed transactions can be verified using the platform’s public keys and by viewing their transaction history. This element of transparency will build trust in players and help prevent any sort of fraud. This means full auditability as blockchain gives a triple entry bookkeeping system in which all transactions are irreversible and are timestamped, documented in real-time, encrypted, and cannot be discarded or altered.

Blockchain requires a public key to play along with some form of identification which makes it much safer than any other form of payment method because no one can steal your identity or lottery ticket from you providing an ultimate seamless and secure experience to players.

In addition to all these benefits, blockchain technology empowers unbanked and underbanked population and allows them to participate in lottery! The World Bank reported 1.7 billion unbanked adults globally with nearly 80

million in Europe and north America. Blockchain provides financial inclusion and offers access to many services to these population including lottery.

Other advantages of the blockchain lottery

One of the areas within lottery operation requiring continuous attention, is how to optimize the process of collecting prizes and transferring taxes. The time it takes for a winner to actually get their award in a tangible form varies according to current processes. Using smart contracts, all the logic can be automated to calculate the resulting taxes, including location of residence and other situations that could impact these calculations. Hence, the time required for collection would be significantly reduced.

Finally, the method used to choose the winning numbers is possibly one of the least known but most intriguing parts of using this technology. The creation of random numbersand characters (hashing) with a very high level of security is the foundation for the block generation that gives the technology its name. Utilizing blockchain to add an extra layer on top of the actual process of generating winning numbers could be an ultimate utilization of the technology.

The above aspects where this technology brings major benefits to existing lottery systems, can acquire greater value, if combined with the exploitation of an appropriate digital identity system on top of this system. Luckily, the technology has a very strong solution in providing identity management through its fundamental digital architecture. Thanks to the blockchainized identity of the participants, it would be possible to have much more precise and very limited information about the winners and the actors authorized to operate within the lottery processes based on the need-to-know and need-to-have concepts.

All these features would enable a parallel world where everything in the real world is represented by program codes called virtual reality. The ultimate use case of this virtual reality is metaverse. Blockchain enabled this metaverse to expand rapidly due to the ease of payment via cryptocurrency and immutability and security of the platform (metaverse) is guaranteed by the technology (metaverse).

Lottery and blockchain-enabled applications

Sales revenue has been dropping with the known significant changes in consumer behaviour, demographics of players and their adoption of online and mobile solutions for everyday aspects of life and the resulting need for lotteries to extend the traditional channels.

ONE OF THE BIG CHALLENGES OF ADOPTING ONLINE SOLUTIONS IS HOW ONLINE GAMING WILL IMPACT THE LOTTERY'S BRICK-AND-MORTAR RETAIL CHANNEL SALES AND DIRECTLY CONTRIBUTE TO RETAIL CANNIBALIZATION.

But this is not the only challenge. Studies shows that online solutions have proven inefficient in convincing millennials and Zoomers to participate in the game since transparency, traceability and fairness is still questioned. In addition, the current lottery industry is plagued by a host of issues and inefficiencies which result in excessive administrative and operating expenses. The solution is a business transformation towards a blockchain-enabled future that enhances engagement, empowerment, ownership, and player's experience and guaranteeing a smart, responsible, and sustainable growth while still reinforcing the brick-and-mortar business model.

Embracing blockchain in a transitional approach can address both lottery's internal operating inefficiencies and external demands and expectations by consumers. We are going to further explore some use cases of blockchain and the areas of improvement for the lottery industry if properly implemented.

- Blockchain can drastically improve onboarding and participation time for players providing an enhanced and seamless experience, and eliminates the need for data recording, security threats and authentication and authorization processes converging retail and digital experience and improving operational efficiency.
- Loyalty programs help increase engagement and player retention for lotteries. A blockchain powered loyalty program can be integrated with a play-to-earn concept that revolutionizes the gaming industry with a new, highly engaging format. Automating loyalty program integrated with a P2E model incentivizes and empowers players to always be part of the game with a fully autonomous loyalty program.
- Ticket sales recorded on a blockchain help to prevent ticket fraud. If a user cannot see their ticket entered the system, they know it is not a legitimate purchase. Similarly, it could reduce incidences of fraudulent claims for operators, who would be able to reference a verifiable record of ticket sale transactions traceable back to each vendor.
- All listed transactions on blockchain can be verified by viewing the transaction history. This element of transparency will build trust in players and help prevent any sort of fraud. This also means full auditability as blockchain gives a triple entry bookkeeping system in which all transactions are irreversible and are timestamped, documented in real-time, encrypted, and cannot be discarded or altered.
- One of the biggest challenges for the players to build trust in the specific lottery corporation is to know where and how the collected funds are allocated. This is also an area where blockchain could offer opportunities. it would be feasible, for example, to publish aggregated or high- level financial information like an annual report or to report the charities in which funds were distributed (transparency in where the money goes), but without necessarily disclosing transactional data to the public. However, transactions are still verified by a decentralized blockchain network; therefore, the basis of the published data can still be trusted.
- blockchains have the potential to enhance management of traditional land-based gaming operations, for compliance with regulations as a no-charge-back payment system. For example, payments from customers could be authenticated and finalized with no chance of failure. It can also help to authenticate identities for payment of financial transactions. The process involves using the blockchain as another factor of security to create and verify the identity of users.
- Traditional random number generation or drawing systems in lotteries are centralized and lack an easy cost-effective way to verify the results or if there has been any tampering. Blockchain random number generators, on the other hand, solve this problem by leveraging the blockchain technology to bring transparency, fairness, verifiability, and tamper-resistance into the process of generating numbers. Due

to blockchain's provably fair system, it doesn't require third parties to verify randomness. The blockchain can generate verifiably random numbers and players could then assess the fairness by checking the process themselves.

- With the advent of Web2 and social media, marketing became more about engagement and building relationships with customers. Web3 (blockchain) is moving us into a new era of marketing, one where authenticity, trust, transparency, and ownership are paramount. Non-fungible Tokens (NFT) are one of the key technologies powering this new web. NFTs are unique digital assets, meaning they cannot be replicated or substituted for another asset. This makes them perfect for lottery ticketing, collectibles, and more. Lotteries can gain more trust from customers by issuing tickets that can never be stolen, altered, duplicated, or damaged, so they will always be the true owners, and this will also eliminate labor intensive and long processing time for ticket validation.
- As more and more sectors take on blockchain, there's also a danger of not keeping up with technology and risk of falling behind the competition. Much the same as when the internet came in, it had an impact on almost every sector; companies who were quicker to adapt, benefited more from the opportunities. The online gaming industry, as well as the demographics of lottery players, are rapidly changing. Blockchain technology is the next logical step in the evolution of lotteries, allowing autonomous decentralized operations with a high level of participants' gain, transparency, privacy, security, and integrity.

What is next?

With the raise of blockchain lotteries which in many instances are unauthorized with no contribution to social and good causes, it is inevitable for traditional lotteries to take action and start creating their presence on blockchain in order to protect their market share and expanding their reach to a whole new generation of players – Gen Z and Gen Alpha – that soon expect to do everything on blockchain.

Block Expert is committed to build with its partners the infrastructure that allows state-authorized lotteries to be more circular by building their presence on blockchain, while maintaining the brick-and-mortar business model and accelerating their social purpose mission.

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