

 A New Alternative

Blockworks Research

A surreal landscape with orange mountains, a glowing yellow and orange vertical prism, and orange flowers in the foreground.

OKX & Blockworks Research Special Report

The Future of Blockchain Applications: Reshaping Global Industries

May 2025

“Most financial applications will move onchain. You can imagine billions of people transacting freely and with full custody of their value. This will be crypto's biggest contribution to the world.”

Star Xu
OKX Founder & CEO



Preface

OKX is an onchain technology company with a mission to make blockchain-based assets more accessible. It began as a crypto exchange giving millions of people the ability to trade, and over time became among the largest platforms in the world.

Blockworks Research is crypto's most powerful research platform and brings together data, onchain analytics, governance, financial models, and more. Institutions, funds, and protocols rely on Blockworks Research for actionable insights related to their portfolios and businesses.

How did our two companies come to collaborate on **The Future of Blockchain Applications: Reshaping Global Industries?**

The report was born from our mutual stake in the positive disruption blockchain technology is bringing today. Just as the internet and cell phones redefined communication and information sharing, blockchain is transforming the inner workings of companies across industries.

As leaders in the space, we believe these changes and their implications for businesses and society at large deserve a closer look.

Although we can't predict the future, we see great value in analyzing the advancements seen to date to anticipate the trends and developments that are driving blockchain and building the crypto economy of tomorrow. In the report, we explore this change from many different perspectives.

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Introduction

Blockchain and its many applications are changing the world.

Although the last 10 years have been speculative, the next 10 will be defined by blockchain applications redefining major global industries — including financial services, technology, consumer and luxury goods, and sports and entertainment.

In particular, the ongoing development of defined blockchain use cases — cryptocurrencies; real-world asset tokenization; decentralized apps (dApps); practical self-custody; wallets and payments — will act as a key disruptor across vital business sectors.

Moreover, blockchain's emergence into a phase of utility, adoption and ubiquity has profound implications. The World Economic Forum predicts that 10% of global GDP could be tokenized and stored on the blockchain by 2027, with the technology set to become increasingly embedded in daily life [1].

The following pages explore this dynamic with a view to mapping out how the blockchain economy will shape the next two and a half decades.

The report has two key objectives:

- ① First, the findings provide an overview of the current state of blockchain's application in the following global industries:
 - Financial services
 - Technology
 - Consumer and luxury goods
 - Sports and entertainment
- ② Second, the text lays out research-driven predictions and insights about how blockchain can transform existing models in these sectors, how the technology can give rise to new forms of economic activity — and where the blockchain and its key applications are headed in the next 25 years.

The report utilizes a methodology that combines data from Blockworks Research, independent analysis from OKX, and interviews conducted with entrepreneurs and business leaders in the sectors identified above.

High-level insights include:

- ① **A rising tide of asset tokenization is underway.** This is facilitated by dApps that enable the creation, trading, and management of tokenized assets, and could unlock trillions of dollars worth of currently illiquid assets in the future.
- ② **Digital wallet innovations are simplifying the customer experience** — which will enhance user engagement, and spur mainstream adoption. [OKX Pay's practical self custody](#) is one example of this trend.
- ③ **Blockchain opens up new revenue streams for companies across multiple sectors.** The growing proliferation of dApps and other digital asset products is a key driver of this growth.
- ④ **Retail and institutional adoption of crypto in financial services will accelerate.** Asset allocation to crypto will continue to grow across all portfolios.
- ⑤ **Changes in the treatment of data will disrupt current business models.** The shift towards user-centric data ownership will change how data is collected and used.
- ⑥ **AI and crypto will converge.** AI will enable more effective coding and troubleshooting; crypto will create strong incentives for AI training and deployment.
- ⑦ **Real value for end users will grow.** The above-mentioned advancements will converge to benefit users and create incentives for them to invest and participate in the blockchain economy.

In the past decade, the blockchain sector scaled from comprising a handful of cryptocurrencies to constituting a \$2.6 trillion ecosystem. The report explores how the systems supporting that ecosystem are now well-established and stable enough to enable developers to build investable, real-world applications beyond speculation around novel tokens. The evidence collected by Blockworks Research and OKX points to an emphatic conclusion: **growth will continue, and it carries the potential to reshape the global economy.**

Rich Widmann, Google's head of Web3 strategy, put it best: **"Blockchain is a pressure chamber of innovation."** [2]

Understanding how this evolution will play out — and how blockchain technology is likely to advance and adapt along the way — is critical for anyone involved in building or investing in the future.

Innovators, business leaders and global brands consulted or interviewed during the course of the research include the following:



The research collected makes it clear that the blockchain ecosystem is moving inexorably towards practical, scalable applications across all of the surveyed industries, creating a virtuous alignment of interests and value among developers, businesses and end-users.

Innovative blockchain applications are being developed across all of the industries covered in this report, and the research focuses on a handful in each sector.

Decentralized Applications:

Finance	Technology	Brand	Entertainment
Spot bitcoin ETFs	The Render Network's decentralized GPU marketplace	TYB by Avalanche	McLaren Racing's digital collectibles
Crypto mutual funds/ETPs	Solana by Solana Labs	IBM's Food Trust	Box Office by Sports Illustrated
Visa Tokenization Asset Platform	Gitcoin Passport	Hyperledger Fabric	Off the Grid on Avalanche
Crypto remittances	Dune's blockchain data analytics dashboard	Supply chain traceability	Fan tokens - FC Barcelona, UFC, Formula 1 teams
JP Morgan's JPM Coin	Google Web3 Cloud	Digital product passports used by Louis Vuitton	Manchester City & OKX digital collectibles
High-frequency trading and risk management tools	Bittensor crowdsourced AI model development	NFTs for ethical product authentication	Peer-to-peer sports betting
TradFi - DeFi integration platforms	AI micropayments	NFT-based product authentication	NFTs for music and merchandise - e.g. Kings of Leon, 3LAU
Digital wallets	IPFS cloud storage	Blockchain-enabled consumer data analytics, used by Starbucks	Tokenized film investments
Crypto custody services	Arweave permanent decentralized data storage	Blockchain for product lifecycle tracking: L'Oréal	Blockchain-based royalty systems - e.g. Audius, Royal
Crypto based payment rails	Google Web3 hybrid blockchain cloud solutions	NFTs for enhanced customer experience	Decentralized streaming, e.g. Livepeer
	Worldcoin's Proof of Humanhood		Ronin blockchain for gaming
	Peer-to-peer cloud and internet services		Interoperable gaming assets
			Blockchain gaming guilds and cooperatives
			IP and royalty enforcement
			AI-driven dynamic worlds

Finance

Reshaping Value Creation and Financial Products

- ① **Institutional investors continue to allocate capital to digital assets and related products.** Further development of trading products and custody services will make it easier for investors to allocate and increase exposure in the years ahead.
- ② **Stablecoins are primed to alter the global payments landscape.** Major firms like Visa are investing money and resources, and today's top stablecoins continue to grow in market capitalization and use.
- ③ **Crypto exchanges will rewire how assets trade in the world.** This shift is already underway and has spurred market incumbents to explore innovations such as 24/7 trading hours.
- ④ **Major financial services firms are moving toward a tokenized future.** More than two-thirds of financial services interview respondents said they are developing capabilities to support the issuance and servicing of tokenized assets.

Investing and Asset Management

Current State

A pronounced shift toward passive investing is underway as investors become more comfortable with alternatives.

A core aspect of blockchain technology in financial services is its ability to transfer value securely and efficiently between parties immutably without the need for intermediaries. The decentralized nature of blockchain ensures that transactions are verified by a network of nodes, reducing the risk of fraud or manipulation.

Elwood Asset Management said:

“Institutional adoption of blockchain-based financial services is expected to grow steadily as regulatory clarity improves, making institutions more confident in adopting digital asset solutions. Blockchain offers operational efficiencies, such as faster settlement times and reduced costs for digital assets, which could attract institutions seeking to streamline processes. As blockchain infrastructure becomes more scalable and customizable, institutions will be incentivized to adopt it for broader use cases like trade settlement and portfolio management. Tokenization of traditional assets will enable institutions to access liquidity and fractionalize investments.” [3]

In recent years, new digital technologies have emerged that have enabled faster and more seamless trading and interactions across the financial services ecosystem. This innovation, together with the increased use of blockchain and blockchain wallets in trading and financial services, has moved forward the merger of traditional finance with emergent technology.

Investing and Asset Management

Current State

According to Ernst & Young's 2024 institutional investor research report:

- **43%** of respondents have invested in digital asset mutual funds/ETPs
- **37%** of respondents are actively holding spot cryptocurrencies
- **59%** of asset managers plan to launch a crypto fund in the next two years

Ernst & Young Asset Manager Survey, May 2024 [4]

A key event that illustrates acceptance of digital assets in traditional finance was the US Securities and Exchange Commission's approval of spot bitcoin ETFs in early 2024. The participation of industry giants such as BlackRock, Fidelity, Invesco and State Street brought with it critical institutional credibility.

As Ophelia Snyder, co-founder and president of 21Shares – one of the world's largest crypto ETP issuers – stated:

“We're seeing enhanced institutional adoption of crypto worldwide. This isn't solely a retail product, and institutional investors are starting to understand the role crypto products can play in a broader portfolio. In the US market, institutional investors are buying bitcoin ETFs. Adoption is amongst the quickest we've seen for any new ETF category.” [5]

The majority of interview participants concurred with the view that institutional adoption of crypto and digital assets is steadily increasing. This view is also evidenced by the growth in total market capitalization of bitcoin ETFs to \$116.51 billion across 21 products since the inception in 2021 [6].

Snyder also highlighted the Michigan state pension fund's interest in bitcoin ETF products as a signal of expanding awareness and demand for such products: “This is a fantastic sign of how many of these pension plans are currently thinking about the asset class or will be in the near future.”

Investing and Asset Management

Future State

As advancements in blockchain technology continue to revolutionize financial services, many expect to see a future state where more efficient, transparent, and accessible systems emerge for investing and asset management. In the future, crypto and decentralized finance (DeFi) platforms will increasingly disrupt and alter traditional financial models, and digital assets will become a core component of mainstream financial products.

The research shows that today's successes will fuel a wave of innovative new products, further focusing investor attention on digital assets.

Many respondents said they are already working on or exploring how to establish infrastructure and services to support the issuance of tokenized products — indicating that today's slate of BTC and ETH exchange-traded funds is only the beginning.

Morgan Krupetsky, senior director of BD at Ava Labs, said that “tokenization will do for assets what ETFs did for mutual funds.”

Digital tokens represent a significant improvement over ETFs — digital assets trade 365 days a year, 24 hours a day, and are programmable via smart contracts, allowing for automatic rules-based rebalancing and even lower costs for the investor [7].

Interviewees also said that digital assets will create new revenue streams, and therefore present financial incentives for continued work in this area.

Anchorage, for example, said that it expects digital assets to be a common component of both institutional and retail portfolios.

“Just as the ETF boom democratized access to a wide range of investment strategies, I believe blockchain-based assets will open up new opportunities for market participants of all types,” a spokesperson said [8].

Payments and Remittances

Current State

The payments industry is a key part of the global economy. According to McKinsey, its revenue pool amounted to \$2.4 trillion in 2023, and is expected to top \$3 trillion by 2026 [9]. Meanwhile, global remittances reached nearly \$670 billion in 2023, representing a 3.8% year-over-year increase [10].

Despite its global relevance, the payments industry is plagued with inefficiencies due to its reliance on legacy rails. An outgoing international wire transfer can cost up to \$75, while some banks charge a fee for accepting an incoming international transfer [11]. Credit card processing fees hover between 1.5% and 3.5%, with merchants forced to wait up to three days for the processing company to deposit funds into their bank account [12].

In contrast, crypto uses internet-native rails, with networks such as Solana consistently registering median fees below a cent of a dollar and near-instant settlement times. The integration of crypto with existing payment solutions, combined with increasing regulatory clarity, can alleviate existing inefficiencies and reduce costs for merchants and consumers.

Stablecoins have a major part to play in this transformation. These assets are already well-established in certain markets because of the cost and speed advantages they bring over conventional systems — two features that make them well-suited to facilitate remittance payments.

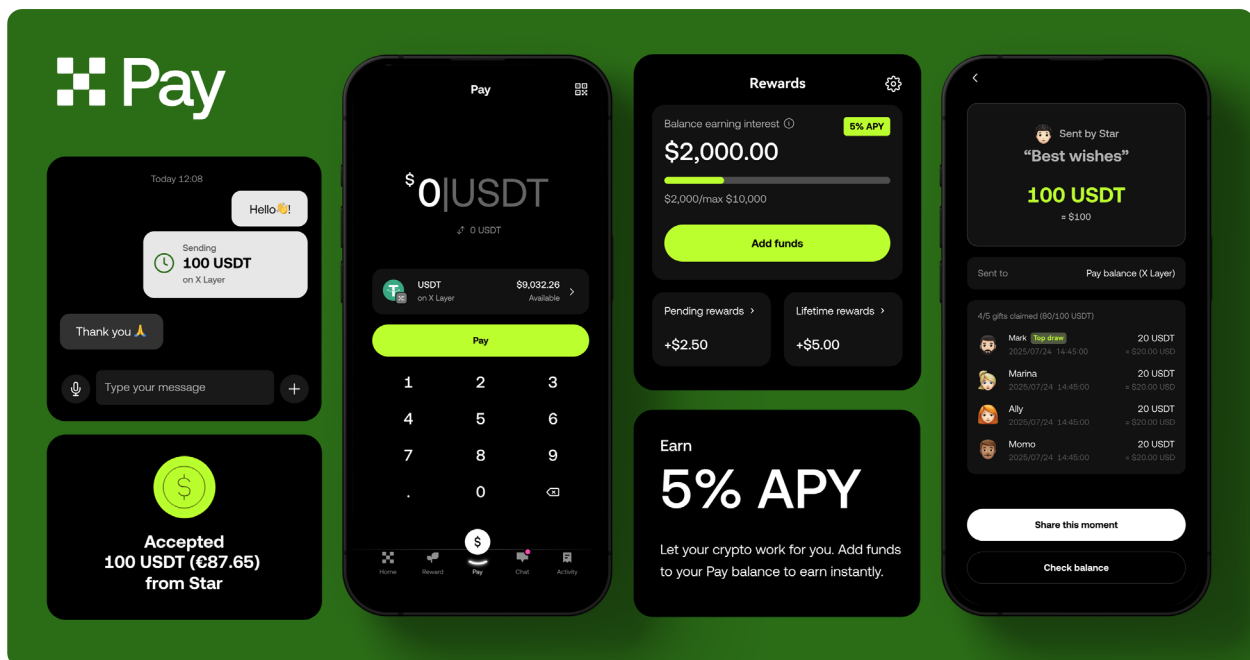
As a result, crypto-native firms are leveraging blockchain technology and the stability of fiat-pegged stablecoins to enable instant, low-cost global payments. OKX for example, recently launched its [OKX Pay](#) solution, which utilizes stablecoins such as USDT and USDC to facilitate near-instant transfers, bypassing legacy banking bottlenecks and improving cash flow and price stability for users.

One of the most significant advantages of crypto payments is cost. In Q1 2024, the global average cost of sending \$200 was 6.35%, per data from The World Bank [13]. Many crypto services process transfers for as low as .05%, and some, such as OKX Pay, have zero transfer fees. This makes the service particularly valuable for cross-border payments and merchant settlements, where conventional payment processors levy substantial fees.

Payments and Remittances

Current State

Beyond speed and cost savings, these innovative services provide enhanced accessibility. Users can send funds globally without maintaining multiple currency accounts or paying foreign exchange premiums. Self-custody features allow merchants to receive payments directly to their wallets while maintaining full control of their assets. In combination with the above, new services, including OKX Pay, offer seamless integration for e-commerce platforms, enabling businesses to accept crypto payments without complex technical implementation.



As regulatory frameworks for stablecoins mature, crypto payment solutions are poised to bridge the gap between crypto efficiency and traditional payment reliability, offering a compelling alternative to outdated financial infrastructure.

Stablecoins have also caught the eye of governments looking to bring greater

efficiency to payments. Nations in Sub-Saharan Africa and Latin America, for example, are increasingly adopting stablecoins to hedge against local economic instability and for lower-cost remittances [14]. Brazil in particular has seen a surge of crypto usage over the past two to three years, with 90% of the flow linked to stablecoins as a means of making global payments [15].

Payments and Remittances

Current State

Other countries are now taking firm action towards embedding stablecoins into their own financial systems. Many eyes are on the United States and its progress towards crypto regulation following the return of President Trump to the White House.

In January 2025, President Trump issued an executive order to strengthen America's leadership in digital financial technology. The order included a policy to develop a dollar-backed stablecoin with the aim of "promoting and protecting the sovereignty of the United States dollar" [16]. Weeks later, stablecoin bills were introduced in Tennessee and California, which aim to formalize the regulatory framework to protect consumers while encouraging innovation [17]. In addition, the growing momentum of the GENIUS Act amongst lawmakers in the first half of 2025 has set the stage for stablecoins to become the first major piece of the crypto puzzle to be fully regulated in the US.

Endorsements such as this can accelerate the global acceptance of stablecoins, while sparking fresh use cases that bring about lasting positive disruption. On the players behind the disruption, Harvard Business Review puts it simply, "the companies that control the stablecoin market will wield substantial influence over the future of money" [18].

Those leading the stablecoin market are busy advancing the infrastructure that's required if the technology is to become more deeply infiltrated in mainstream finance. Interoperability is key to achieving this. When stablecoins can move freely across chains, users benefit from a simpler experience overall — removing a barrier to adoption.

Payments and Remittances

Current State

Traditional finance companies can support here, building blockchain technology into products and platforms without compromising on the seamless and intuitive experience end users have come to expect.

Global payment giants such as PayPal and Visa have taken steps toward integrating cryptocurrency as a form of payment, further expanding the utility of digital currencies beyond speculation.

For instance, Visa is supporting Spanish Banking giant BBVA to launch its own stablecoin. According to Francisco Maroto, BBVA's head of digital assets and blockchain, the bank is currently participating in a new Visa programme designed to help firms develop their own tokenised assets [19].

However, businesses and regulators must work together before crypto permeates the payments industry worldwide. Nathan McCauley, CEO and co-founder of Anchorage, said:

“Realizing these opportunities requires overcoming some challenges. Technical interoperability is complex as traditional financial systems often rely on legacy infrastructure not designed with blockchain in mind. The decentralized nature of blockchain technology also requires new, crypto-specific solutions for compliance with AML and KYC controls.” [8]

Payments and Remittances

Future State

In this sector, blockchain is viewed as a new payment rail that can operate alongside, but will not entirely replace, existing payment systems.

Financial infrastructure is notoriously resistant to fundamental change, but blockchain presents a viable path forward. Tokenization plays a central role in this shift, with key use cases emerging across payments, cross-border money movement, and programmable finance.

The goal of blockchain integration in this framework is to enable many use cases on a single payment rail by connecting different markets and asset classes. By enabling the programming of digital money, existing processes can become more capital-efficient.

Visa is intensifying its commitment to tokenization by launching the Visa Tokenization Asset Platform (VTAP), a project that has been in development for more than two years.

VTAP is Visa's suite of APIs that enable partner financial institutions to tokenize deposits, connect to offchain Visa services, and use blockchain rails to make B2B, B2P, and P2P payments in and out of banks.

Payments and Remittances

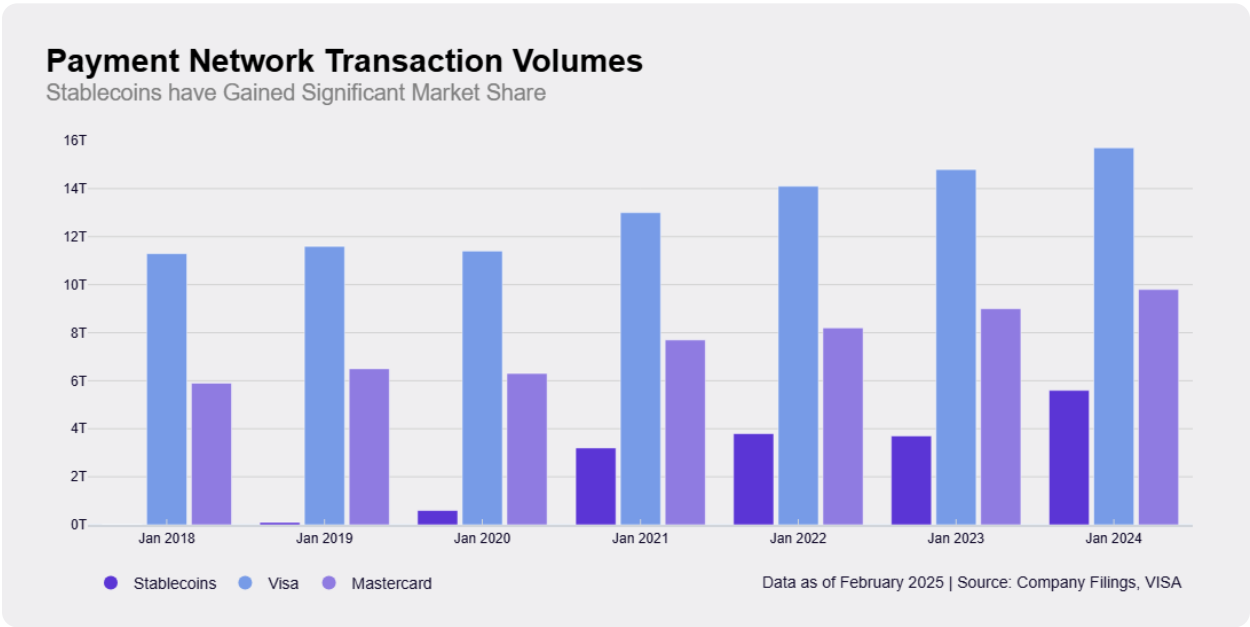
Future State

Payments is one area where blockchain’s integration has the potential to bring efficiency gains that grow exponentially as adoption increases in the coming years. According to Paolo Ardoio, CEO of stablecoin issuer Tether, USDT and other stablecoins can improve “by orders of magnitude your ability to do business” [20].

This benefit can not only be felt in the speed with which payments can be sent and received, according to Ardoio, but also through the related due diligence merchants perform.

As Ardoio notes, when stablecoins like USDT are commonplace among the global payments infrastructure, blockchain will allow sellers to validate that a buyer holds the USDT they claim to.

This essentially brings the proof-of-funds process onchain, where blockchain’s transparency and immutability can help accelerate the due diligence process and better protect merchants.



Payments and Remittances

Future State

As stablecoins continue to gain market share in the future, crypto-based remittances will provide greater access to global financial systems for the underbanked or unbanked. In addition to the chart above, World Bank data shows that in some countries, remittances make up as much as 30% of GDP [13], which further highlights the potential impact of crypto remittances on economies.

Rather than displacing legacy systems, however, interview respondents said they see a future where blockchain and digital currencies coexist with and enhance the infrastructure and products of traditional finance.

The result will be a hyper-connected global economy whose growth is determined by an increasingly borderless world.

Trading, Custody, and Wallets

Current State

Some takeaways from the research:

- Financial companies, including asset manager Elwood, are developing new and sophisticated tools for trading, risk management, and portfolio management across blockchain assets.
- Digital wallets are more sophisticated and easier to use than ever before, and are fundamental to how users experience platforms and services.
- Crypto-native firms have solved legacy issues around self-custody, making it easier for the next-generation of users to onboard to Web3 using their own digital wallets. In the future, financial services companies will create their own decentralized apps (dApps) on top of self-custody wallets.
- Tokenization of traditional assets is enabling new trading opportunities and increased liquidity for previously illiquid assets.
- The 24/7 nature of digital asset markets is changing trading dynamics and risk management strategies.
- There is potential for near-instantaneous transactions and increased liquidity across various asset classes.

Trading, Custody, and Wallets

Current State

Current digital asset trading infrastructure is marked by diverse trading strategies, an increase in high-frequency trading, and support for a broad range of assets and products.

Giovanni Vicioso, Head of Digital Assets Strategy, CME Group, said in an interview that blockchain's most significant impact on trading will be a shift towards 24/7, instantaneous settlement in traditional markets.

Vicioso also stated that use of crypto rails is increasing, and highlighted a shift away from speculation, with digital assets beginning to merge into a broader categorization, namely "investible technology." [21]

Many traditional financial institutions have also branched into cryptocurrencies. Goldman Sachs offers OTC crypto trading, options, and futures trading for BTC and ETH, while Standard Chartered offers a trading and custody platform for institutional participants through a partnership with OKX. Meanwhile, Fidelity Digital Assets offers comprehensive digital asset services, including custody.

Recent innovation in self-custody by crypto firms has produced new solutions that address long-standing challenges around security, accessibility, and usability. Traditional self-custody methods, including hardware wallets or seed phrase backups, often require technical knowledge and introduce risks such as sending to the wrong address, potential lost keys or exposure to phishing attacks. Additionally, the difficulty of transacting directly from self-custodied wallets limited their adoption for everyday use.

Trading, Custody, and Wallets

Current State

To solve these issues, crypto companies are leveraging advanced technologies such as multi-party computation (MPC) wallets, account abstraction (AA), and zero knowledge (ZK) email recovery, for example, which eliminate single points of failure by distributing key management across multiple devices or parties, enabling secure recovery without vulnerable seed phrases.

Modern wallet designs also prioritize user experience, offering biometric authentication, intuitive interfaces, and social recovery options to make self-custody more accessible. Platforms such as OKX are further bridging the gap by integrating the above recovery features into self-custody wallets with DeFi, CeFi, and payment services, allowing users to trade, earn yield, and spend assets without relinquishing control or sacrificing security.

One notable innovation is OKX Pay, which enables instant, low-friction, low-cost transactions directly from self-custodied wallets, enhancing liquidity and usability. This solution includes a feature where users don't need to manage a private key. This benefits both everyday users and merchants — individuals retain full ownership of assets while businesses can accept crypto payments without intermediaries.

In addition, institutional players like Fidelity Digital Assets and Standard Chartered (through partnership with OKX) are also offering hybrid custody models that combine self-custody flexibility with enterprise-grade security.

As a result of this innovation, core infrastructure has become more mainstream and easier to access, paving the way for all financial institutions to eventually develop and deploy proprietary dApps on top of self-custody wallets.

These advancements are transforming self-custody into a practical, secure, and integrated component of the broader financial ecosystem. By reducing friction and improving security, crypto companies are empowering users to maintain full asset ownership while creating a Web2-like experience on Web3—paving the way for wider adoption of decentralized solutions.

Trading, Custody, and Wallets

Future State

Over the next 25 years, crypto trading will advance exponentially in sophistication, with new tools, products, and protocols being created in the process.

Digital wallets, for example, are expected to enable whole new use cases as they become more sophisticated.

Sandy Kaul, SVP and Head of Digital Asset & Investor Advisory Services at Franklin Templeton, said there is potential for blockchain technologies to replace session-based regional trading with 24/7 global trading, and book-order with atomic settlement. The technology could also see bi-lateral transaction records moved to shared ledgers, alongside ending today's complicated account-based approach by moving all holdings to a cryptographically protected wallet.

Kaul stated:

“Over the next 10 years we anticipate a shift in expectations that would reposition an investor's portfolio to the center of their lives and enable them to earn rewards and receive incentives from their holdings, much like credit cards provide today. The investment portfolio will cover short-term liquidity needs, optimize forms of payment, facilitate experiences, allow the investor to better leverage their own assets and cover long-term savings and retirement goals. This will allow the asset management industry to deliver on a vision of better living through investing.” [22]

Trading tools have come a long way in the past decade thanks to the evolution of onchain data analysis, social media sentiment monitoring, and alternative data. However, the industry is still marked by fragmented liquidity across multiple exchanges, creating the need for advanced risk management tools, the majority of which are developed in-house.

Trading, Custody, and Wallets

Future State

As regulatory clarity improves, an increasing proportion of volume will be driven by institutional investors — a trend that will in turn drive the need for more sophisticated offerings, such as structured products and derivatives.

In the coming decades, crypto banking services will be fully integrated into traditional banking systems. Many major banks could offer comprehensive digital asset services ranging from crypto-enabled debit, credit, and financing, to a diverse array of more sophisticated products.

Simultaneously, the distinction between “crypto banks” or “neo banks” versus traditional banks will largely disappear. This is certainly anticipated in guidance from the US Department of the Treasury’s Office of the Comptroller of Currency (OCC), which allows national banks and federal savings associations to use public blockchains and stablecoins for payments [23]. Many traditional banks now also offer crypto custody, trading, and investment services, while crypto banks and neobanks similarly offer traditional banking products such as checking accounts, debit cards, and loans.

Emerging Financial Products

Current State

A remarkable degree of product innovation is taking place in financial services, and much of it is driven by digital assets and blockchain.

Financial institutions are commonly leveraging blockchain for transaction settlement, product operations, and streamlining processes — resulting in significant cost savings.

There is also a growing race to offer full-service banking for digital asset customers. Custody lies at the foundation of this development. By providing the critical infrastructure for secure storage and protection of digital assets, banks can build trust with customers. This, in turn, allows banks to offer additional financial services on top, such as trading, lending and borrowing, staking, and payments [8].

Stablecoins, too, are growing in sophistication and capitalization. The market has reached a collective value of \$180 billion, with USDT and USDC dominating the landscape [24]. Issuers are emphasizing regulatory compliance and diversifying their backing assets.

As mentioned previously, bitcoin ETFs and other products are gaining momentum. Recent approvals indicate growing regulatory acceptance, although progress remains slow. The value proposition to banks is clear. The total market capitalization of commodity-backed tokens is greater than \$1.1 billion currently [25] and is conservatively expected to exceed \$10 trillion by 2030, according to Roland Berger [26]. Such growth reflects the extent to which a more diverse range of asset types is capturing investor mindshare.

Financial institutions plan to tokenize ownership of hard and soft assets and to create their own tokens, as in the case of JP Morgan's JPM Coin, used for instant payments.

Emerging Financial Products

Future State

A clear theme emerged from interviews with leaders of both crypto-native and non-crypto-native financial institutions: blockchains will be used to settle transactions, manage products with greater transparency, and streamline operations.

Senior professionals at Franklin Templeton, Elwood Asset Management, and Visa, all stated a belief that tokenization will impact treasuries, bonds, equities, commodities, real estate, and credit, and that these products will benefit from increased liquidity, accessibility, transparency, and composability.

Through tokenization, liquidity from previously illiquid asset classes will be unlocked and entirely new asset classes will be created. Carbon credits, fine art, and even IP will be tokenized, creating fractional, easily tradeable digital representations and unique new assets. Tokenization of carbon credits, for instance, could enhance market liquidity and transparency, potentially accelerating global efforts to combat climate change.

Tokenization of intellectual property might create new markets around patents, copyrights, and other intangible assets, with far-reaching implications relating to innovation and value creation.

New products will also emerge that combine these asset classes in unique and interesting ways.

For instance, a tokenized real estate investment trust (REIT) could increase liquidity, lower barriers to entry by enabling fractional ownership, and improve the accuracy of property valuations.

Proof of Reserves

Current State

Proof of Reserves (PoR) has emerged as a critical tool for enhancing transparency and trust, particularly for centralized exchanges. By offering cryptographic proof that they hold sufficient assets to cover user deposits, exchanges can provide verifiable reassurance to their customers. OKX is an industry leader in this regard, using advanced methods such as Merkle trees and zero-knowledge (ZK) proofs, and producing monthly PoR reports for two and a half years.

The Merkle tree structure allows users to independently verify assets are accounted for in the exchange's reserve holdings without compromising privacy. This cryptographic approach maintains data integrity by securely hashing transaction data and proving the existence of each user's assets without exposing sensitive information.

ZK proofs have also become an essential innovation in PoR as they enable exchanges to validate their holdings without disclosing specific asset details, enhancing privacy and proving solvency. As ZK proof technology develops, it is expected to further streamline and secure the PoR process.

PoR is not provided exclusively by exchanges, however. While exchange PoR focuses on proving that the exchange holds sufficient liquidity to cover user assets, token PoR verifies that token issuers hold adequate reserves to back their circulating tokens. For exchanges or token issuers alike, only blockchain solutions can offer this level of transparency.

Proof of Reserves

Future State

In the years ahead, the role of PoR in crypto audits will evolve significantly. Traditional third-party audits, though still in use, will likely be augmented by real-time, cryptographic audits that use PoR methodologies. With the growing sophistication of blockchain technologies, including the use of ZK proofs and advanced cryptographic techniques, exchanges will be able to provide continuous proof of their reserves. This will likely drive a shift from periodic audits to ongoing, transparent solvency checks.

McCauley added:

“The radical transparency of blockchain technology can help solve traditional compliance challenges, offering new tools for auditing, tracking, and verifying transactions in real-time. Our goal is to help create a regulatory environment that unlocks the potential of crypto, while maintaining the safety and soundness of the financial system. It’s a complex challenge, but one we believe is essential to get right.”
[8]

Technology

Technology & Infrastructure are Transforming Onchain

- ① **Blockchain has changed how software, networks, and data systems are constructed and used.**
- ② **The future of AI will be influenced by blockchain.** Startups and developers are exploring how blockchain can decentralize the development of artificial intelligence systems.
- ③ **Privacy and blockchain will improve symbiotically online,** enabling users to transact pseudonymously while maintaining control of their personal data.
- ④ **The convergence of blockchain, cloud computing, and AI is underway** and could grow into a multi-trillion-dollar-opportunity.

Software Development, Indexing, and Analytics

Current State

Blockchain-based smart contracts have fundamentally changed the way software is developed.

With open-source software, developers can freely analyze the core source code of a protocol and learn exactly what led to past successes or failures. To make informed decisions, though, developers need access to data around network key performance indicators (KPIs).

As a result, a new market for indexing and analytics has emerged. More orderly, digestible data formats are proving valuable to companies around the world.

Fredrik Haga, co-founder and CEO of crypto analytics platform Dune, emphasized that blockchain's openness allows anyone to download and analyze data freely. This accessibility accelerates innovation, as developers can study successful protocols and learn from past failures. This transparency creates an evolutionary dynamic, enabling developers to iterate more rapidly.

“Smart contracts are open source, and you can see exactly how many users they have and what those users did,” Haga said. “This makes innovation accelerate much faster because everyone can see what led to adoption or what failed.” [27]

This is in sharp contrast with how traditional tech companies typically silo and restrict access to such information.

Software Development, Indexing, and Analytics

Current State

Challenges remain. As Google Cloud's Widmann said:

“Look at the structure of crypto data — there is a great irony in the openness and transparency, but opaqueness at the same time due to the problem with block explorers.” [2]

However, once this data is structured builders can use it to provide traders, investors and other decision-makers with more information about the market.

Widmann further explained that this presents a fantastic opportunity for generative AI. By processing massive amounts of unstructured blockchain data, AI can create advanced search products that not only return raw data but also provide contextual insights into transactions and smart contracts.

Sophia Zhao from Alumni Ventures noted that the convergence of Web3 and AI enhances security, enabling more robust analytics platforms that can serve both the crypto-native and traditional finance sectors [28].

For instance, the US government has used Chainalysis to assist in various criminal investigations, helping to trace millions of dollars in stolen funds. In another example, the German Federal Criminal Police Office used Arkham to trace and seize almost 50,000 BTC from operators of a piracy website [29, 30].

In sum, blockchain's inherent transparency and decentralization is beginning to solve many of the flaws of opaque and centralized legacy systems.

Software Development, Indexing, and Analytics

Future State

Improving the developer experience is critical as more talent enters the space. A major stumbling block, according to the research, is a lack of familiarity with crypto-native coding languages.

Google Cloud's Widmann said he believes that generative AI, combined with advanced blockchain indexing and analytics products, will help developers overcome these hurdles.

He said:

“You have this brilliant idea, but how do you transform it into code? A developer could use AI-powered search to find what blockchains have the most liquidity, give you the smart contracts with the highest TVLs, and then go to the code portal and build the tooling because you don't know that blockchain's coding language.” [2]

This approach could significantly reduce the time to launch new blockchain applications, in turn bridging the gap between innovation and consumer usage.

Widmann envisions creating a product that enables users to search for specific events on the blockchain and also get context on what happened with the help of generative AI.

For example, a user could theoretically input a hash of a specific transaction, and the search product could return structured data around what tokens were transferred and explain the transaction in natural language.

Ultimately, the convergence of blockchain and AI will accelerate the former's utility and evolution, paving the way for mass adoption.

AI Model Development

Current State

The convergence of blockchain and AI is just getting started and is still broadly underappreciated.

Today, the production of AI models is highly resource-intensive, both in monetary terms and computationally, but blockchain networks and decentralization could change this.

Jules Urbach, founder of the Render Network, explained that blockchain helps coordinate computational resources for AI training and inference, “Networks like Render are using blockchain to build decentralized AI infrastructure, leveraging the combination of peer-to-peer networks and token incentives to coordinate computation more efficiently.” [31]

The Render Network, for example, is a decentralized blockchain-based GPU marketplace that allows users to contribute their idle GPU computing power in exchange for payment. To date, Render’s computer network has rendered over 38.1 million frames, supplying artists with affordable compute resources for 3D effects.

In addition to computing for AI training, the decentralization of machine learning model development is also underway.

Bittensor, a blockchain protocol designed to incentivize decentralized machine learning model development, enables anyone to contribute to open-source machine learning models. To date, the protocol has yielded 36 models, called subnets, providing unbiased alternatives to frontier models which are owned and operated by centralized entities.

Traditional tech companies are taking more decentralized approaches to AI model development as well.

Google Cloud’s Widmann added that Google is creating an open ecosystem for users in a hub and spoke model: “We have an open garden to AI that allows people to get access to any model, not just Gemini. Portal will be the first version of an open ecosystem where they can come to Google to get the best of any innovation anywhere.” [2]

Not all consumers will feel comfortable accessing decentralized model services directly. A hub and spoke model, like the one Google is employing, could bring decentralized models directly to users through familiar rails.

Ultimately, the convergence of developers, data and infrastructure providers, and investors is making it possible to bring decentralized AI to the masses.

AI Model Development

Future State

Looking ahead, Urbach said in an interview:

“It’s foolish to bet on centralization in the field of technology. The lessons of Linux or Wikipedia show the power of open-source decentralized development. It will be the same for AI. We’re working with a number of large cap companies in open-source standards organizations to create the media and infrastructure primitives of the future.” [31]

Adding to the insight above, Urbach said he believes the future will include decentralized AI powered by blockchain, with transparently crowdsourced, attributed, and remunerated data.

“Participants such as data providers, computer infrastructure providers, and AI developers can get remunerated transparently via onchain smart contracts for their contributions,” he explained. “We’re already seeing Data DAOs emerge, where collectives form around data pools used for training large language models.” [31]

According to Dune co-founder and CEO Fredrik Haga, “AI agents will be a big thing — crypto offers the perfect rails for agents to conduct economic activity.” [27]

AI Model Development

Future State

Digital-wallet-enabled agents will transact onchain and interact with smart contracts — but crucially, humans will be able to control and monitor their actions.

This presents a challenge, though. AI services typically employ monthly subscription models through proprietary interfaces — an approach that will become impractical as the array of services and agents grows exponentially.

Next-gen blockchains like Solana can provide the high-throughput micropayment infrastructure required for the productization of AI services, enabling developers to monetize models on a per-usage basis for the first time. Urbach indicated that this is “a natural product market fit for blockchain.”

In turn, crypto micropayments can help unbundle AI services and unlock widespread consumer usage. Overall, the integration of blockchain with AI promises to democratize AI development, enhance data privacy and ownership, and foster new sectors.

Urbach believes that this will facilitate a macroeconomic restructuring from industrial-age economies to ones increasingly built on creative production.

“The digital exchange of virtual goods and services will, over time, supplant physical labor and fiat exchange,” Urbach noted.

Widmann echoed this sentiment:

“Looking 20 years ahead, Google envisions a world where digital intelligence can seamlessly transact in digital forms, enhancing everyday tasks and interactions without the need for traditional devices. This reflects a broader ambition to integrate AI with blockchain for more efficient commerce and agreement codification.” [2]

Privacy and Identity

Current State

The issue of data ownership and privacy related to technology was highlighted during Mark Zuckerberg's 2018 US Senate hearing, which focused on concerns about infringements of private user data.

Blockchain technology offers a solution to this problem by enabling individuals to own and control their personal data. Privacy preserving blockchain technology will enable users to interact with decentralized applications and submit only the information that is needed for a specific transaction.

As blockchain ecosystems become more interconnected, ensuring privacy in cross-chain transactions will be critical as well.

Polygon Labs is addressing this challenge by implementing zero-knowledge proofs in their cross-chain interoperability solutions, thereby protecting user identities and transaction details across multiple platforms. This advancement is essential for users who engage with multiple blockchains but require consistent privacy assurances.

"A novel ZK proof called a pessimistic proof will help secure interoperability across the AggLayer. This will make blockchain transactions faster, cheaper,

and more secure," according to Will Macfie, Director of Growth Marketing at Polygon Labs [32].

At the same time, the rise of generative AI has also brought into question the importance of user identity and authentication systems.

The proliferation of deep fakes as a result of generative AI poses a threat to information integrity and public trust.

Blockchain enables authentication of any digital information, allowing users to verify the source of online content. For example, Worldcoin is building a privacy-preserving human identity network so that individuals can distinguish content created by humans from that which derives from generative AI models. To date, Worldcoin has verified over 6 million users.

Ethical concerns arise from such projects' reliance on biometric data due to fears of potential misuse by surveillance states.

Another example of a crypto project developing identity solutions that don't rely on biometrics is Gitcoin Passport, which allows individuals to create onchain credentials by collecting "stamps" from different authenticators.

Privacy and Identity

Future State

As AI continues to evolve, issues around data privacy are likely to proliferate.

Imagine a scenario where each individual has their own powerful AI assistant to help with all aspects of digital life. These assistants would, as a result, know everything about individuals, and if they were controlled by Big Tech, privacy would be at risk.

Various blockchain-based technologies — including ZK proofs, fully homomorphic encryption (FHE), and multi-party computation (MPC) — are under development to enable the sharing and privacy-preserving computation of encrypted data.

This means users can interact with AI models without revealing the contents of their own underlying data.

“Blockchain can protect user ownership of data in an age of AI, giving artists and consumers control of what data is used to train models, and control of what data is leveraged by AI apps,” said Urbach.

Although these technologies are at an early stage, decentralized private computers will be a necessary precursor for mass adoption of personalized AI.

Cloud Solutions

Current State

Today, many projects rely on blockchain technology to create decentralized alternatives to centralized cloud services, making the web faster, safer, and more transparent. Developers are increasingly dedicating time to building decentralized infrastructure that leverages blockchain's capabilities to transform traditional cloud computing.

For instance, IPFS is a peer-to-peer distributed file system that allows users to host and access files in a decentralized manner. The network has 230,000 unique weekly active nodes, and has become a staple for the Web3 community and cryptocurrency ecosystems.

Developers are also working on decentralized data storage protocols that can protect against data censorship in an increasingly polarized world. A notable example is Arweave, which enables permanent data storage and has been actively used to preserve cultural and social documents.

In March 2024, an archival pool was created leveraging Arweave to preserve digital artifacts relating to Iran, in light of the country's geopolitical instability. The pool now includes articles from over 60,000 sources [33].

While traditional companies and firms are beginning to see the benefits of blockchain technology, there remains a gap between their perceptions and those of developers.

Until better abstraction layers are built to connect end users to decentralized cloud services, the fragmentation between developers, investors, companies, and consumers will slow adoption.

Cloud Solutions

Future State

Looking ahead, developers are focusing on creating more scalable and interoperable decentralized cloud solutions that are easier to integrate into existing systems.

Google Cloud's Widmann said that he believes blockchain represents a bring-your-own-market technology — in other words, it enables anyone to create a peer-to-peer marketplace around a variety of cloud services, from computer to storage, models, and more. [2]

Google was one of the first cloud providers to develop a connector between Google Cloud Storage (GCS) and Filecoin, enabling users to utilize GCS as a decentralized container through the familiar interface of Google Cloud.

Because the decentralized cloud market is in its early stages, the gap between centralized and decentralized systems can be bridged in ways that address questions around visibility, privacy, and security.

As Widmann summarized, “The future of cloud computing is likely a combination of centralized and decentralized solutions, with centralized providers being among the biggest contributors to leading decentralized networks.”

This architecture will maximize the size of the cloud market while giving users the optionality to choose the infrastructure that works best for them.

Brand

Blockchain is Enhancing the Brand Experience

- ① **Major consumer and luxury brands are poised to tap blockchain's potential.** Big box retail operators like Walmart and luxury brands such as LVMH are integrating blockchain to revolutionize supply chain transparency and production processes.
- ② **Consumer and luxury brands are experimenting with use cases that can reshape their businesses,** including digital product passports, luxury-brand NFTs, smart contracts for business practices, and blockchain-based product lifecycle tracking.
- ③ **Consumer and luxury goods are blending the physical and digital** for an onchain future, and digital experiences will foster loyalty across different types of consumer businesses.

Blockchain technology has made significant in-roads in the consumer, luxury goods, and retail industries.

For this section, several sub-sectors were examined within the consumer and retail industry. These included apparel retailers, luxury brands, electronics, e-commerce, beauty and cosmetics, automotive, art, food and beverage, logistics and shipping, and jewelry.

Retail Goods and Services

Current State

Of the companies analyzed in the consumer goods, retail, and luxury industries that have blockchain initiatives in progress, a quarter had implemented or explored integrating blockchain to revolutionize supply chain transparency and production processes.

Other categories that were of interest in the sector were NFTs, product authentication and anti-counterfeiting, and data management.

Consumer goods and retail giants Walmart, Carrefour, and Unilever are implementing blockchain to enhance supply chain traceability, improve food safety, verify product authenticity, and substantiate sustainability claims.

This level of adoption demonstrates growing recognition of the technology's utility for real-world use cases. These companies are trendsetters and their actions can influence the entire retail and consumer sector, with downward ripple effects waterfalling to other global retailers such as H&M and Zara.

For instance, Walmart's use of IBM's Food Trust blockchain allows for the rapid identification of contaminated products and facilitates efficient recalls.

Built on Hyperledger Fabric, using the IBM Food Trust platform, its system allows Walmart to trace the origin of over 25 products from five different suppliers in just 2.2 seconds. It previously took seven days to perform such checks [34].

Walmart also requires its vegetable suppliers to adopt Hyperledger Fabric to increase internal accountability and improve food safety and traceability, and continues to test the use of blockchain in various countries and geographies crucial to its supply chain.

While large retailers are taking steps to utilize blockchain to improve supply chain transparency, mid-tier and boutique retailers may face challenges following suit due to high implementation costs, the complexity of integrations with existing systems, and a lack of standardized protocols and regulatory frameworks to guide such integrations.

Web3 companies such as Ava Labs are taking steps to facilitate this integration: Ava Labs Chief Business Officer John Nahas and its Senior Business Development Director Morgan Krupetsky revealed that the firm is trying to "provide a way for Web2 companies in any industry to upgrade tech infrastructure in an end-to-end way [7].

Retail Goods and Services

Future State

The Head of Metaverse at one of the world's largest consumer brands said that the organizing principle of the internet is shifting toward "experience" — the essence of the metaverse.

A shift from "mass culture" to "micro-cultures", wherein product value is increasingly defined by consumer alignment, is underway, our interviewee asserted [35].

In this context, NFTs will become important for assigning unique identities to objects and experiences.

Experimentation also creates brand differentiation. In today's fast-moving media world, brands need more positive content and unique propositions to stand out. By embracing NFTs, and the metaverse as a whole, they can create new ways of generating media and consumer attention.

Ultimately, brands that can successfully leverage blockchain capabilities stand to gain significant competitive advantage through stronger customer relationships, enhanced brand value, and by setting new standards for ethical and sustainable practices in their respective industries.

The work being done today by Starbucks, Walmart and others is only the beginning [36].

In the years ahead, many products will be equal parts digital and physical. Put simply, any product can be paired with a piece of unique data on a blockchain that will allow it to be authenticated and tracked throughout the entire consumer lifecycle.

The convergence of various technologies is expected to create more personalized experiences, allowing individuals to become the center of their own digital universes.

Marc Baumann, the founder and CEO of FiftyOne Ventures, echoed this point: "With [blockchain] data, brands can leverage machine learning and smart contracts to offer highly personalized, automated experiences, giving consumers greater control and ownership over the products they engage with" he said [37].

Blockchain will allow brands to learn more from data than they can currently. For example, if a customer uses a blockchain wallet to buy an item, the open nature of blockchain networks will allow more meaningful data to be gleaned, securely, from each transaction using advanced analytics tools.

Luxury Goods

Current State

The luxury goods industry is experiencing strong growth. Global sales exceeded \$1.24 trillion in 2023, and are projected to grow 4.04% annually over the next four years, according to Statista [38].

Alongside this growth will come new customer segments emerging with evolving demands. Specifically, there will be an ever greater focus on millennial and Gen Z consumers — who have accounted for 30% of luxury sales but 85% of growth over the last 10 years, according to Bain & Company — and a greater focus on experiences [39].

To address these changing market dynamics, luxury brands are turning to blockchain technology as a means of enhancing authenticity, transparency, and customer engagement.

Luxury apparel brands are using blockchain to explore the idea of having a physical and digital layer interacting together. For instance, Gucci enabled holders of its Vault Material NFTs to redeem the digital collectible for limited edition wallets and duffle bags [40]. Other brands like Nike have also launched digital collectibles that give access to exclusive apparel, finding tremendous success. For instance, the Nike-RTFKT non-fungible token collections had generated nearly \$1.4 billion in trading volume and \$170 million in earnings as of 2023 [41].

In the luxury goods and jewelry sectors, firms have embraced blockchain technology to combat counterfeiting and verify ethical sourcing. LVMH, Cartier, and De Beers are at the forefront, having created digital certificates and NFTs to authenticate products, track ownership history, and verify the sourcing of materials such as diamonds and precious metals.

In the beauty industry, while specific implementations are less publicized, companies like L'Oréal and Estée Lauder are exploring blockchain for ingredient traceability and substantiation of eco-friendly practices.

Luxury companies are also utilizing blockchain for proof of ownership and verification of product authenticity. According to Lou McEwen, McLaren Racing's Chief Marketing Officer, "we could see blockchain being applied in areas like merchandise authentication, further enhancing trust and transparency." [42]

For instance, Swiss luxury watchmaker Breitling issues an NFT with each watch. This blockchain-backed proof of ownership enables customers to access premium services and the watch's product information, such as warranty status and full history [43].

Luxury Goods

Future State

The luxury goods sector will benefit from blockchain in many of the same ways listed for more general consumer focused retailers.

Product authentication may be a core growth area for blockchain application in the consumer goods space. Last year, US customs agents seized roughly \$2 billion in counterfeit goods, signaling that fake products continue to flood the market [44].

Consumers who opt to purchase luxury goods likely do so because they want the best of the best. A unique piece of blockchain data will help to verify the authenticity of their goods. In addition to delivering a better consumer experience, this will help the product retain its value.

The Head of Metaverse offered sneakers as an example, highlighting how buyers of luxury sneakers will in future receive an NFT as well — a piece of data that both supports authenticity and gives the owner something special alongside the product.

Consumer Loyalty

Current State

The utility of blockchain-based technologies extends beyond production and the supply chain to the ways users consume data and experiences, and develop brand loyalty along the way.

Greg Swimer, Chief Technology Officer at City Football Group, underscored the role blockchain technology can play in brand loyalty, especially via digital collectibles or NFTs:

“Manchester City have released digital art and free-to-claim collectibles with our partner OKX celebrating on-pitch success, giving fans a unique way to commemorate key moments in the club’s history. These digital assets not only deepen the emotional connection with the team but also engage new and existing fans in a modern, accessible way, driving loyalty and enhancing the fan experience by offering something exclusive and memorable to own.” [45]

FiftyOne Ventures’ Baumann also sees the potential for blockchain technology enhancing brand loyalty, but warned:

“Many consumer brands were jumping on the NFT hype for the wrong reasons, believing that blockchain-based loyalty activation would solve engagement. Over 50% of Interband’s Top 100 Global Brands launched loyalty-driven NFT activations. At 51 Insights we’ve looked at all of them. Most failed to create sustained engagement and ROI and stopped their programs.” [37]

The prevailing lesson is clear: to successfully enhance consumer loyalty, brands could likely benefit from using blockchain technologies as a means to an end to enhance existing programs, rather than viewing them as the end-all-be-all solution.

Consumer Loyalty

Future State

If today's blockchain-centric loyalty projects are focused on broadening adoption, what does the future hold?

Blockchain could potentially provide the technology rails for more individually tailored loyalty experiences. Furthermore, cryptocurrencies could offer the means to provide loyal customers with digital assets that have actual value and are usable beyond one particular brand's application.

Baumann predicted that blockchain and crypto systems will help make existing loyalty programs more efficient and beneficial to the end user.

“Undoubtedly, blockchain technology offers real potential. It can scale loyalty programs across brands, enable personalized, more granular rewards, and make loyalty points transferable,” he said.

Entertainment

Changing the Game for Sports & Entertainment

- ① **Sports organizations and teams are leveraging blockchain technology to enhance fan engagement** through digital collectibles, team-specific tokens, and unique experiences. Blockchain applications are expected to expand into new areas including metaverse and sports betting.
- ② **Crypto will allow creators a greater share of — and control over — revenue.** This is in stark contrast with today's state of affairs, in which creators in the film, TV, and music industries must share revenue with hosting platforms.
- ③ **Blockchain will reshape the gaming landscape and provide financial incentives to players.** Interoperability and the play-to-earn model can create more sustainable funding models for gamers.

Sport and Fan Experiences

Current State

Sports organizations are exploring the use of blockchain-based tokens to give fans unique ways of engaging with their favorite teams or celebrities. By utilizing blockchain-based tokens and NFTs, teams aim to deepen the connection with their supporters and attract new audiences.

Major sports teams, esports organizations, MMA companies, and Formula 1 racing teams have launched fan tokens on the Chiliz blockchain through the Socios platform.

Users can purchase, trade, and consume these tokens in order to participate in various activities such as voting on team decisions, accessing exclusive content, and earning rewards.

Examples of teams and organizations exploring this technology are: FC Barcelona, the Argentina Football Association, Natus Vincere, the UFC, and Aston Martin Cognizant.

NFTs are used in the industry to create digital collectibles, onchain experiences, and loyalty rewards that enhance the fan experience.

For example, OKX is partnered with Manchester City Football Club across a variety of fan engagement verticals, including 'Unseen City Shirts' Digital Collectibles: commemorative football shirts that can be minted as digital collectibles (NFTs) on the OKX app and redeemed for exclusive prizes.

Sport and Fan Experiences

Current State

OKX also partnered with McLaren Racing to create digital collectibles using blockchain technology. McLaren views digital assets as a new and unique way to boost fan engagement, especially among younger audiences.

Lou McEwen, McLaren Racing's Chief Marketing Officer said of the partnership:

“At McLaren Racing, we see blockchain and digital assets as an important way of enhancing our fan engagement. Our aim is to deepen the connection between our fans and the team by providing innovative and exciting opportunities. Digital assets offer new avenues for us to engage a younger generation of fans, allowing them to collect unique items, interact with the team, and express their fandom in new ways.” [42]

The Race Rewind Digital Collectibles is a collaborative initiative between OKX and McLaren Racing that enabled fans to collect, own, and interact with unique NFTs centered around McLaren's Formula 1 season.

McEwen continued:

“Following races, fans can claim a free ‘mystery box’ digital collectible minted on OKX's XLayer chain. After the race, these mystery boxes update with images, quotes, and statistics, along with sounds from the McLaren F1 Team environment. Depending on the rarity of the collectible unlocked, fans can redeem prizes such as tours of the McLaren Technology Centre and Q&As with our drivers.” [42]

NFTs are making their way into other sectors, as well. SI Tickets, a fan-first ticketing site from Sports Illustrated, is creating a complete NFT ticketing platform called Box Office that aims to revolutionize the ticketing industry. This platform reduces fees for fans, while also guaranteeing security, authenticity, and rewards for usage.

The technology can be applied to more sectors than just sports, however. In fact, it has widespread applications across the music industry and other event-based businesses.

Sport and Fan Experiences

Future State

As sports digital collectibles continue to increase in popularity, McEwen expects the space to expand to new franchises and verticals:

“At McLaren Racing, we anticipate that Web3 will continue to introduce new interaction methods between teams and fans across the sports landscape, not just in Formula 1. As sports entities discover innovative ways to utilize blockchain for fan engagement, we will need to continuously push boundaries and innovate to maintain our competitive edge in this space and ensure an exceptional experience for our fans.” [42]

One key area of expansion will be Metaverse engagement, which Manchester City FC is already exploring with OKX. The integration of blockchain technology into the metaverse can create immersive experiences that bring fans closer to their favorite teams and athletes.

As digital collectibles become increasingly ingrained in our culture, new issues around authenticity arise, however.

Sport and Fan Experiences

Future State

McEwen said of blockchain transparency:

“Sports memorabilia is one area where transaction chains can exist, with items traded many times over and across years or even decades. Therefore, the use of blockchain could allow fans to be more certain that the items they were purchasing in any authorized secondary market were genuine. Blockchain would also offer better opportunities for teams and athletes to provide proof and certainty of origin, and drive down fraud.” [42]

One use case that has yet to take off is decentralized sports gambling.

The broader sports gambling industry has seen significant growth in recent years, with companies like FanDuel and DraftKings reaping the benefits of the sector’s legalization. Like most traditional sportsbooks, these sites generate commission through a built-in margin from the odds offered.

A decentralized protocol could utilize token incentives to bootstrap a peer-

to-peer sports betting marketplace, in turn creating a product that removes the rent-seeking intermediary of traditional sportsbooks, thereby creating a more efficient market for participants.

Film, TV, and Music

Current State

Creators in the entertainment industry have historically faced challenges monetizing their work and capturing the full value of their creative output. Third-party intermediaries often siphon big portions of revenue, leaving artists with a smaller share of the profits generated from their IP.

The intersection of blockchain technology and the music industry — although very much in its infancy — shows promise and may be able to solve these issues.

Artists are using blockchain to offer unique digital collectibles, limited edition releases, or even fractional ownership of their catalogs in the form of NFTs. Some examples are Kings of Leon, Grimes, and 3LAU, who have all generated significant revenue through selling NFTs representing limited edition albums, exclusive artwork, virtual concert tickets, fan experiences, or merchandise.

The technology is now also beginning to be used in the film and TV industries. Warner Bros. Discovery is piloting projects from various IPs, creating personalized avatars and storybooks through interactive character studios that leverage blockchain technology [7].

Blockchain is also being applied to new forms of capital formation, with the aim of democratizing IP ownership.

Pressman Films, the production company behind movies like *Wall Street* and *American Psycho*, recently launched a blockchain and tokenization-enabled crowd investment opportunity for its community. The capital raised will be allocated towards new projects, leveraging a mix of existing and new intellectual property [7].

Film, TV, and Music

Current State

Blockchain is also enhancing event experiences. Forward Studio, a consumer-focused company shaping the future of entertainment through emerging technologies, has worked with major entertainment brands like Coachella to enhance event experiences for patrons. In 2024, the Coachella Canvas Quest was a free-to-play online quest that rewarded fans for participating in physical and virtual Coachella experiences [46].

This kind of technology could become a crucial part of how artists attract and reward patrons to their performances or reward loyal fans who attend their shows. Blockchain technology is also being explored to solve royalty tracking and distribution issues.

Investors are increasingly interested in projects that leverage blockchain to transform film, TV, and music. As more assets are tokenized, the opportunity for both fans and investors will grow.

Film, TV, and Music

Future State

The music and film industries have long grappled with challenges in ensuring artists receive fair compensation for their work, including issues largely stemming from complex royalty structures and outdated distribution platforms.

The 2023 Writers Guild of America strike highlighted these ongoing issues, and even actors often struggle to obtain royalty agreements for the films in which they play critical roles.

Projects such as Audius and Royal are attempting to create more transparent and efficient royalty systems, in which an artist's work can be tracked throughout its entire life cycle.

Blockchain will enable such IP to be licensed “permissionlessly,” with revenue paid automatically to the original creator.

By providing a transparent and immutable ledger, blockchain-enabled royalty tracking and distribution platforms can ensure that artists are fairly compensated, while simultaneously removing rent-seeking intermediaries.

Finally, digital film distribution and streaming requires significant compute resources. Livepeer is developing a decentralized video infrastructure network for live and on-demand streaming, with the goal of giving creators autonomy from monopoly platforms [47].

The democratization of streaming through a decentralized product like Livepeer could unlock even more revenue to be returned to artists by enabling direct creator-to-consumer relationships. While developers are pushing the industry forward, there is often a disconnect between them and creatives such as musicians and artists. Once this hurdle is overcome, creators might realize the empowering nature of this technology, and mass adoption could occur very quickly.

Gaming

Current State

Bailey Tan, Head of Ecosystem at Ronin, stressed in an interview that the potential for blockchain to revolutionize gaming by enabling player-owned gaming economies is enormous.

“Community plays a large part in a game’s success, especially at early stages. In the early days, token rewards can help bootstrap the game,” she said [48].

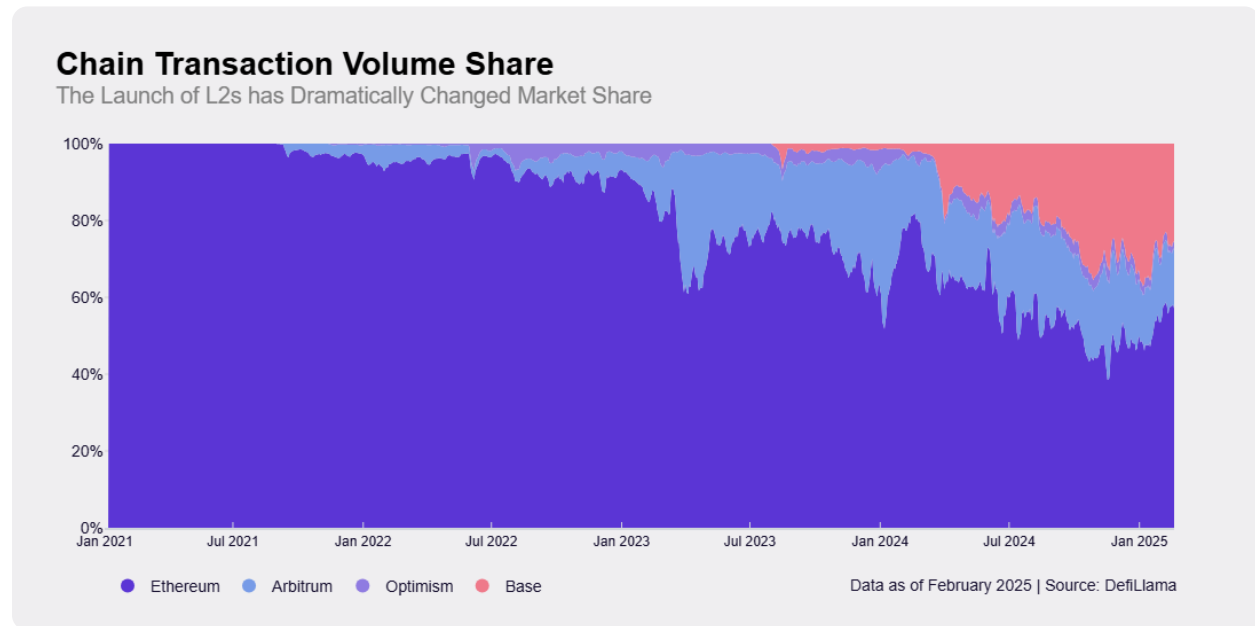
Axie Infinity’s explosive growth in 2021 foreshadowed what’s to come. Blockchain-based play-to-earn models are proving they can onboard millions of users and generate significant economic activity.

Teams have solved the wallet and scalability challenges that previously plagued blockchain game developers.

With hyper-efficient layer twos and wallets that abstract away gas payments, technology has enabled developers to build games that aim to deliver top-flight experiences to players.

Gaming

Current State



OKX partnered with Web3 gaming platform Immutable in early 2024 to introduce a GameFi NFT launchpad and integrate Immutable's gaming-focused zkEVM chain into the OKX Marketplace and OKX Wallet.

Partnerships such as this could help to finally tip Web3 gaming into the mainstream. As evidence of the sector's growth, Immutable reported a 900% increase in signed games year-over-year between Q1 2023 and Q1 2024.

Gaming

Future State

Looking to the future, Tan sees the rise of gaming cooperatives and guilds that will have significant influence on game development.

Large guilds will have the ability to boost specific games or influence the governance decisions of open ecosystems. While future blockchain games might incorporate sophisticated economic models that could include player-driven marketplaces around play-to-earn activities, gaming guilds might control various aspects of the in-game supply chain.

In turn, play-to-earn games might provide careers for a select group of specialized individuals who trade their time for money.

However, as Tan noted: “If you’re expecting to live off a game, that game has to be very large. Consumption levels have to be very high — you could be a full-time content creator, pro player, or specialized role that is a core part of the supply chain of the game.” [48]

Tan also said that standards will be built that enable interoperability between blockchain games, adding that new studios will build out games around existing IP to attract user bases and drive adoption.

This means small studios can target popular in-game asset collections to build around, or popular IP where they can expand existing universes. Interoperability will also enable players to move assets between games.

Gaming

Future State

Simultaneously, blockchain could enable royalty enforcement, such that those who own the IP are properly rewarded.

As Tan put it: “More creators will demand their creations are onchain and have some proof that they were the one that created it. In turn they own the IP and they can control and also assign licenses for others to use for their creation.” [48]

From the developers’ perspective, there is a focus on integrating blockchain in ways that improve gaming experiences without overwhelming the player with technical complexities. This is the unlock that will lead to mass adoption.

Finally, Tan sees deep integration of AI in gaming: “An AI could run the logic of the world — natural disasters, NPCs, and quests — that make the world feel real.”

AI agents could be leveraged to help gaming feel more dynamic and fresh, creating a constantly evolving world that provides players with unique experiences every time they log in.

To conclude, blockchain technology holds significant potential to revolutionize gaming. Realizing this potential requires bridging the gap between developers, companies, and consumers through education, and innovation which abstracts the technical blockchain elements of a game away from the end users.

2025 & Beyond

2025 & Beyond

If the next 25 years are to be defined by a major shake-up of global industries driven by blockchain-based applications, what might 2025 bring towards this end? 2024's headline moments give guidance on what might follow. Let's take a closer look.

Bitcoin's continued price strength through 2025

Many would agree that it's not possible to explore bitcoin's role in the transformation of industries through 2025 and beyond without looking at the asset's price.

The dynamics of supply and demand that fuel bitcoin's volatility are more complex today than ever before, thanks to the arrival of Spot BTC ETFs and increasing institutional investment. As prices rise, so does interest from players who've not yet significantly gained exposure to digital assets.

Investment management firm VanEck predicts bitcoin will be valued at around \$180,000 during 2025 [49], while Anthony Scaramucci, Founder and Managing Partner of asset manager SkyBridge, believes the asset could hit \$200,000 [50].

This rise in value can be partly attributed to a supply squeeze amplified by two factors: the 2024 bitcoin halving event, and inflows to Spot BTC ETFs. Historical price action shows that the halving, which occurs approximately every four years and sees the bitcoin mining reward cut in half, typically causes a drop in supply that isn't immediately felt.

Although historical performance is no guarantee of future events, a halving-driven spike could continue during 2025. What's different now is the influence of Spot bitcoin ETFs. By the end of January 2025, the funds' total holdings had passed \$125 billion — more than 6.05% of the current BTC supply [51]. The bitcoin held in these funds are essentially removed from circulation, further tightening the supply squeeze.

2025 & Beyond

The rise of self-custody-based dApps

Self-custody-based dApps could come into sharper focus during 2025 as more users recognize the importance of self-custody and refinements are made to the user experience. Industry commentators have pointed to the sometimes complex Web3 onboarding experience as a hurdle to participation [52].

Removing this hurdle will be a priority for many, and a competitive battleground for those building blockchain dApps. This will be joint responsibility for Web3-native entities as well as TradFi firms moving into the space.

In particular, TradFi players could move to offer self-managed wallets and regulated stablecoins. JP Morgan has already made progress in this area with its JPM Coin for instant payments. However, the financial services giant doesn't provide crypto custody services. Could this change as competition grows?

OKX is working in a similar vein to transform its self-custody Wallet into a gateway for all dApps. Just as Google is the go-to for web access, OKX aims for its Wallet to be the first destination for finding and interacting with dApps. Meanwhile, the exchange's Web3 arm,

which includes the Wallet, is evolving to better support retail users with self-custody. OKX is planning to become a leader in inscriptions and was the first to launch support for emerging token standards Atomicals, Stamps, Runes, and Doginals.

One other key use case that could emerge during 2025 is crypto loyalty schemes. Earlier, this report outlined how major consumer and luxury brands are seeking to capitalize on blockchain's potential for supply chain management and production processes. Loyalty schemes could be a powerful third opportunity, because blockchain addresses many of the limitations of conventional loyalty schemes and their infrastructure. For example, traditional loyalty programs are often siloed by brand, and don't allow customers to pool rewards from multiple brands.

The decentralization and interoperability brought by blockchain can create a unified, tamper-resistant system that maximizes the effectiveness of loyalty schemes. Meanwhile, the immutability of blockchain technology can help prevent fraudulent activities, such as claiming fake points or accessing a user's legitimate points by breaching a centralized system.

2025 & Beyond

Tokenization and the arrival of equities onchain

If the arrival of spot ETFs in 2024 marked a watershed moment for TradFi's move towards cryptocurrencies, 2025 could see a deepening of this involvement through the utility of blockchain applications.

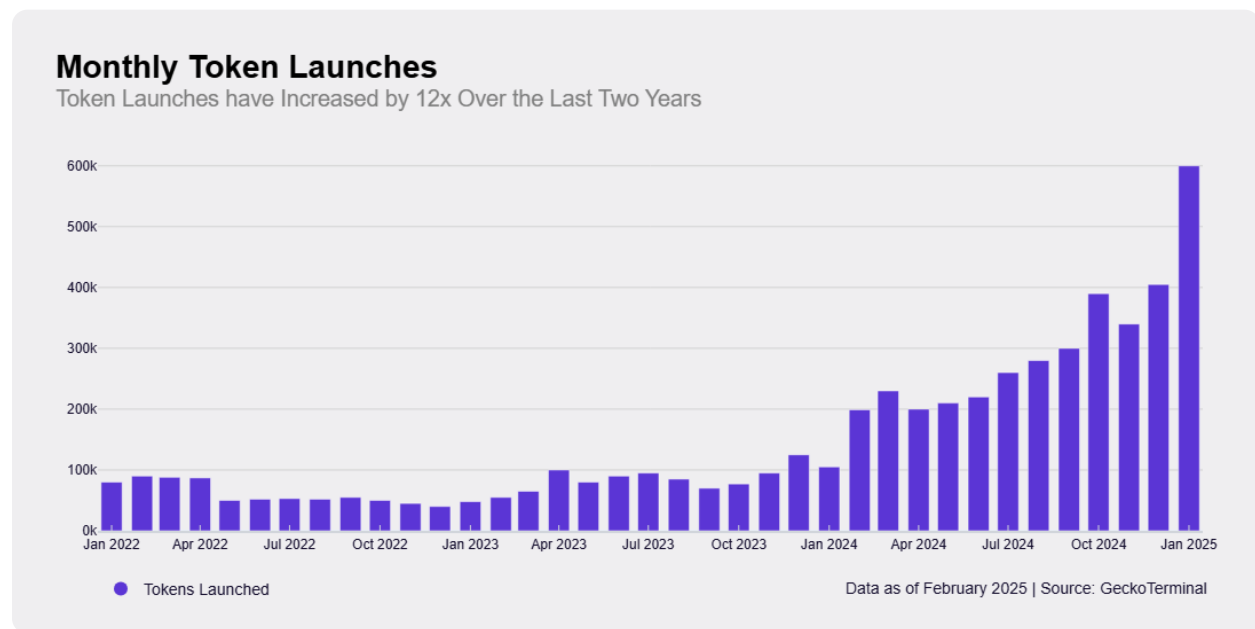
The tokenization of real world assets (RWAs) could follow spot ETFs as a core offering for TradFi institutions as they seek to broaden their products while modernizing outdated structures. Tokenized securities can allow for 24-hour access to assets, removing the geographic limitations that restrict traders' actions today. Meanwhile, tokenization can unlock the greater mobility of assets, improving liquidity to aid price discovery.

Fractional ownership is another key benefit of bringing equities and RWAs onchain, with the potential to empower more people towards financial freedom. With fractional ownership, traders can own a portion of an asset — from equity investments to physical real estate — rather than needing to purchase a whole unit. Blockchain democratizes the process of fractional ownership, bringing its benefits to more people worldwide. This disruption is already evident with global asset management group Janus Henderson planning to follow others in pursuing tokenization [53].

2025 & Beyond

A new cohort of crypto and blockchain developers

As blockchain technology grows in adoption through 2025, more developers could follow the opportunity and turn their skills towards dApps. There are reportedly more than 100 million developers on GitHub today [54], and they've made 5.2 billion contributions to more than 518 million open source, public, and private projects [55]. Past data suggests this number could increase. Between October 2020 and October 2023, the global number of blockchain developers grew by 66%, despite a bear market beginning during this period [56]. This growth was accompanied by a rapid increase in token launches, as developer tooling made it easier to build.



2025 & Beyond

The arrival of new developer talent in 2025 could have a flywheel effect where fresh expertise breeds innovation which attracts more new talent, and so on. A spike in blockchain developer numbers is arguably further validation of crypto's acceptance as a new alternative to traditional financial systems, as developers shift from conventional industries to a revolutionary space.

What areas might these developers focus their energies on during 2025 and beyond? Building the intersection of AI chat agents with blockchain technology is one possibility. Although the growing pervasiveness of AI across industries is well known, its integration with blockchain technology

can multiply the benefits. Stablecoin issuer Circle has demonstrated how AI and blockchain can transform what is known about conventional payments [57]. They've shown how AI agents can be programmed to complete tasks and process payments autonomously, all underpinned by blockchain's speed and security. Companies could own AI agents that interact with other agents behind the scenes, providing a passive income stream paid out in stablecoins.

2025 & Beyond

Evolving brokerage platforms and two-sided marketplaces

Many anticipate the evolution of brokerage platforms and two-sided marketplaces in 2025 [58], driven by an emerging regulatory landscape, new user demands, and further product innovation. Part of this evolution could involve simplifying users' interaction with interfaces to lessen the learning curve. That would require a deeper investment in UX and UI design to capture non-crypto-natives who might be turned away by overly technical processes.

As outlined above, tokenized real-world assets could become a more prominent part of platforms' offerings. Demand for this is growing, and providers are increasingly recognizing the advantages tokenization can bring to assets that otherwise face relatively high costs, geographic limitations, and slow, manual process. In fact, global consulting company Boston Consulting Group predicts the total assets under management of tokenized real-world assets could reach \$600 billion by 2030 [59].

2025 & beyond

Generative AI finds new use cases

Investments in generative AI (GenAI) are predicted to grow by 60% between 2024 and 2027, according to another Boston Consulting Group study [60].

The crypto scene was quick to embrace GenAI, with token creation emerging as a key use case. Pump.fun, a democratized Solana memecoin marketplace, attracted a spike in users as AI-generated assets took off [61], fueled by the speed and simplicity through which new memecoins could be launched. Users no longer need deep technical expertise to create and distribute a coin. As a result, by 2024's close, seven tokens were being launched on Pump.fun every minute, on average [62].

Beyond memecoins, broader iterations of GenAI are well placed to disrupt industries in 2025. In late 2024, BlackRock announced that its tokenized BUIDL fund was expanding beyond the Ethereum network to other blockchains. The move allows developers to build on top of the BUIDL fund in their chosen ecosystem, creating opportunities for DAOs to be integrated with the fund [63].

Add to this the increasing involvement of AI agents within DAOs, and the world could see autonomous organizations taking a major leap forward to play a more involved role in financial products like BUIDL and others.

Conclusion

Blockchain is no longer just a buzzword — it's become a powerful driver of innovation, rapidly transforming global industries and economies. As shown throughout this report, the integration of blockchain into finance, technology, consumer goods, and entertainment is already reshaping traditional models, sometimes in surprising ways.

In financial services, blockchain is leading the shift toward asset tokenization, proof of reserves, and 24/7 trading. The tokenization of real-world assets is unlocking liquidity, while stablecoins are revolutionizing global payments. As more traditional financial institutions adopt blockchain technology, we are witnessing the early days of a more transparent, efficient, and decentralized financial world.

In technology and infrastructure, blockchain is enhancing transparency and decentralization across cloud services, AI model development, and data privacy. It's helping developers leverage open data, creating decentralized cloud solutions, and facilitating the convergence of AI and crypto. Blockchain is expected by industry stakeholders to drive the development of AI, for example by offering decentralized marketplaces for computational resources and enabling peer-to-peer innovation across technology sectors.

In the consumer and luxury goods sector, blockchain is used to boost supply chain transparency, fight counterfeiting, and offer new customer engagement experiences through NFTs and digital product passports. Major brands such as Walmart and LVMH are already tapping into blockchain solutions to trace the lifecycle of their products and create unique digital identities that blend physical and digital ownership.

In the sports and entertainment industry, blockchain is reshaping how fans engage with teams and creators. Digital collectibles, NFTs, and fan tokens are deepening fan interaction, while decentralized platforms are creating new opportunities for direct creator-to-fan engagement. In the gaming space, play-to-earn models and interoperable assets are creating more sustainable economies for players, while sports teams are leveraging NFTs to enhance fan loyalty and create new revenue streams.

What this report makes clear is that blockchain is bigger than Bitcoin, and even crypto. The technology is already driving innovation across industries, and the interview and research results show that the trend is just beginning. The companies that seize these opportunities now will shape the future of the decentralized, digital-first global economy in 2050.

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