

EMERGING TECH RESEARCH

VERTICAL SNAPSHOT

Blockchain

2022



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Executive summary

In 2021, blockchain captured public attention with renewed fervor. Enormous growth in the number of NFT transactions and funding for crypto exchanges made headlines; notably, Coinbase (NASDAQ: COIN) publicly listed and FTX raised nearly \$1.5 billion in disclosed deal value in the year. Though blockchain technology is far from mature, broad conceptual and technical underpinnings are taking shape, accelerated via increasing investor participation. In the past 12 months alone, successive venture funds dedicated explicitly to crypto have continuously ballooned in size, with Andreessen Horowitz (a16z) most recently announcing its intention to raise \$4.5 billion for two funds.¹ Such eager participation, in concert with increasing corporate experimentation, suggests that blockchain is finally having its moment.

Not all are so enthusiastic. Public sentiment remains highly polarized toward blockchain developments, with skeptics expressing concern about NFTs, cybersecurity risks, and financial speculation. Securities and Exchange Commission (SEC) chairman Gary Gensler seems determined to curb speculative excess, and major hacks continue to disrupt crypto operations. Immense challenges remain before blockchain sees widespread adoption, but there is mounting evidence to support the notion that these obstacles represent growing pains and not ironclad barriers. Blockchain startups, now hyper-capitalized, must address issues such as interoperability, scalability, and utility to fully pivot the narrative.

The existing blockchain opportunity encompasses over 1,600 companies which raised \$23.8 billion in venture capital (VC) funding in 2021 and already an astounding \$5.6 billion through March 15, 2022. Financial services led the way, largely via the growth of the decentralized finance (DeFi) ecosystem, but infrastructure startups focused on Web3 and decentralization are guickly reaching parity. This report explores innovation across four core blockchain segments. We provide insight on recent acquisitions, key investment themes, and leading crypto investors.

1: "Andreessen Horowitz Looks to Raise \$4.5B for New Crypto Funds: Report," CoinDesk, Sheldon Reback, January 20, 2022.

Figure 1.

Company count breakdown by geography*



Blockchain timeline

News

Financial events





Government action

Projected event

FEBRUARY 14, 2022

SEC settles with

company agrees

JUNE 2022

Ethereum upgrades to proof-of-stake consensus mechanism Upgrade is expected to drastically increase transactions per second and reduce gas fees, decreasing energy consumption and powering more decentralized apps.

MARCH 10, 2022

Biden announces exeutive order on cryptocurrency

- Order is welcomed by crypto
- advocates, with bitcoin price
- surging 9%. Skeptics expected the
- order to delay regulation.

Industry drivers & outlook

Blockchain polarization will get worse before it gets better. Though it is not unusual for emerging technologies to face skepticism from the broader public, blockchain and its offshoots, such as bitcoin and NFTs, have polarized public opinion more than any technology in recent memory. Questions surrounding utility and trade-offs are at the core of the dispute. While even ardent critics of blockchain can appreciate it as a novel application of software, many still see it as a solution in need of a problem. Opinions differ on the supposed utility of blockchain, its environmental footprint, the financial risks associated, and even the core promise of decentralization.

If this dynamic is to change, 2022 will likely be a pivot point. An explosion of venture funding into blockchain startups in 2021 means that entrepreneurs are better capitalized than ever to pursue their ambitions. As startups continue to scale, founders will have ample runway to handle existing and emerging hurdles. Nonetheless, startups in the space still face significant obstacles surrounding public sentiment. The technology's nascency, and uncertainty regarding cybersecurity and regulation, suggests that at least a few of the early VC bets will likely fail, potentially in spectacular ways. An increasingly unstable geopolitical environment may also portend more high-profile crypto hacks.

The broader public is primed to become more cynical and polarized. The way forward in winning over public sentiment does not rest in media hype or evangelism, but in behindthe-scenes technological innovation that may not make media headlines. Companies must demonstrate blockchain use cases that have tangible value in consumers' lives. As society becomes increasingly digitized, it is probable that blockchain will find its place, although, likely in a less ambitious form than many advocates believe. Until that time, we expect the controversy around blockchain will continue to heat up. **Prominent VC participation is amplifying blockchain's credibility.** Considering the uncertainty and polarization that the industry faces, greater participation from leading VC firms represents a necessary, but by no means sufficient, condition for the eventual success of blockchain. In the past year alone, firms such as a16z, Paradigm, Sequoia, and Electric Capital have each raised more than \$500 million for crypto-focused funds. The enormous success of early investments into FTX and Coinbase has strengthened investor interest, with winners such as Katie Haun, originally of a16z, and Amy Wu, originally of Lightspeed Ventures, moving on to lead new crypto-focused outgrowths—KRH and FTX Ventures, respectively.

Such developments are supercharging blockchain innovation in two key ways: enticing more investors—and subsequent capital—into the industry and attracting talent. The infusion of talent and funding is helping founders point to the increasing credibility of blockchain's potential despite uncertainties. Talented but risk-averse developers and product managers, who preferred to watch from the sidelines pre-pandemic, are being pulled into the ecosystem in greater numbers, often for lucrative reasons. If the first wave of innovation was primarily driven by enthusiasts, the second may be boosted largely by a smart, high-wage workforce that might not share the same zeal as their bosses but are equally committed to getting results. That is good news for the blockchain industry.

This acceleration in activity should not be confused with an overriding endorsement of blockchain's inevitability. Indeed, much of the recent VC activity represents investors' fear of missing out. Various investors are convinced that network effects will play out similarly to the last wave of Big Tech successes, and they believe that getting in early could mean major returns. While the risk-return calculus is understandable, blockchain still remains rife with uncertainty, with issues around government regulation, cybersecurity, and infrastructure still

INDUSTRY DRIVERS & OUTLOOK

representing prominent areas of instability. Nonetheless, if blockchain is to succeed in the long run, it is hard to imagine it doing so without the significant VC backing witnessed in 2021.

Evolving cultural norms toward "digital ownership" will continue to spur NFT adoption. Though NFT utility remains niche and limited, its conceptual underpinnings are sound. The internet era has been predominantly characterized by increasing digitization, with physical goods and services increasingly rendered in digital environments. Cheaper and more sophisticated computing equipment has powered a variety of novel enterprise and consumer digital tools and experiences. Though Moore's Law is slowly reaching the end of its predictive capacity, new chip packaging techniques and materials are ensuring that computers will continue to get faster. Economies of scale and expanding telecommunications infrastructure is making computers of all types-sensors, smartphones, robots-more abundant in more regions of the world.

The scale of these activities strongly indicates that people will continue to invest into digital ecosystems with greater frequency and sophistication. As they do so, old paradigms about value creation, ownership, and physical-digital interoperability will likely morph in many cases and outright collapse in others. Just as music industry veterans could not foresee how the internet would radically disrupt their industry's business model, and fought against such change, new methods of digital communication are currently challenging the status quo.

While we cannot predict what technologies will thrive or how, by understanding the trendline of digital engagement, we can infer that NFTs or NFT-adjacent technology will help propel that vision forward. Consumers spent nearly \$41 billion on NFTs in 2021, prompting companies, such as Twitter, to integrate them into their products.² NFTs are not a monolith, and there will inevitably be various projects that provide greater utility than others. COVID-19 accelerated the trend toward online engagement across areas such as streaming, gaming, and remote work, and even into new areas such as fitness. Despite the significant amounts of time spent online, much activity still exists ephemerally. NFTs, sitting atop immutable blockchains, will enable internet users with a greater sense of permanency within their digital ecosystems.

An obsession with the metaverse will spur further blockchain investment. Nascent, uncertain, ambitious; while these descriptors have been regularly applied to blockchain over the past decade, they are also more recently true of the metaverse, a term used to signify the evolution of the internet in the form of a persistent digital world with more sophisticated virtual ecosystems. In 2019, \$54 billion was spent on virtual goods, and the success of protometaverse experiences, such as Fortnite and Roblox, have convinced Big Tech that digital interactions will be crucial to the future of the internet.³ Such convictions can be seen in Netflix's extension into gaming, Microsoft's blockbuster acquisition of Activision Blizzard, and the significant outlays on augmented and virtual reality research and development.

A core tenant underlying metaverse experiences is the seamless interoperability of digital identity and goods. Gaming is used as a canonical example, whereby an item purchased in one game is expected to be easily transferable to a separate game or experience. Just as one is not expected to purchase a new car when crossing political borders, metaverse creators believe that users should not be expected to repurchase digital goods in separate instances. Rather, a user's purchases, preferences, and identity should be transferable across digital experiences and engagements.

^{2: &}quot;How NFTs Became a \$40bn Market in 2021," Financial Times, Hannah Murphy and Joshua Oliver, December 30, 2021. 3: "Opportunities in the Metaverse," J.P. Morgan, 2022.

This concept requires investment into novel blockchain infrastructure. The immutable and public records that the blockchain enables would strengthen the notion of digital ownership and enable content creators to access data outside the confines of Big Tech's walled gardens. Interoperability is challenging today given the ways that independent tech operators can choose to withhold and monetize user data. However, compelling metaverse experiences would likely incentivize users to choose tech providers that enable them to store their user data on the blockchain, making it more easily transferable. To be sure, the Utopian vision of a single metaverse is unlikely to come to pass in the near future. Nonetheless, progress toward greater interoperability, propelled by metaverse experiences, represents a significant tailwind for blockchain innovation.

Corporate experimentation signals increasing mainstream awareness. As of February 2022, brands such as Taco Bell, Adidas, Walmart, and Visa have all dabbled or shown intent to explore ideas relating to the metaverse and blockchain. Participation from such big-name companies outside of the tech ecosystem represents a significant turning point for the industry, long associated with tech-dominated culture. Nike has been one of the more sophisticated participants, acquiring RTFKT to connect sneaker sales with a digital counterpart secured via NFTs. This type of bet, highly speculative and well outside of Nike's core product area, highlights the importance corporate executives today place on technology and its associated network effects. Companies, from shoe manufacturers to fast food chains, must possess some tech capabilities to capture the largest audience and the most shareholder returns.

However, Big Tech companies have naturally taken a keener interest than most. Twitter made the first prominent splash in January 2022 when it enabled users to upload NFTs as profile pictures, a minor functional ability but significant milestone in the integration of NFTs into digital ecosystems. Not to be outdone, both YouTube and Meta (NASDAQ: FB) have announced plans to integrate NFTs into their social media products. While such decisions have polarized users, they ultimately help increase exposure to NFTs in a light-touch manner that does not negatively impact the user experience. Big Tech companies are also experimenting with creator monetization tools. Advancements here would draw more creators into a company's ecosystem through novel blockchain-based revenue-sharing models, lending greater credence to blockchain's utility.

Environmental concerns will not impede growth. Much has been made of the damaging environmental impact of blockchain technology, primarily through its voracious energy consumption. This is further exacerbated by the speculative value many impose on the technology, with critics suggesting that the energy powering blockchain computations would be better spent elsewhere, or not at all. Bitcoin, which has the largest market cap of all cryptocurrencies, now routinely uses more energy than some countries, such as Chile and Finland.⁴

Although bitcoin has served as the poster child for blockchain technology, cryptocurrencies do not necessitate significant energy expenditure. Energy consumption is largely dependent on the consensus mechanism used by the blockchain in question; most blockchains today are migrating away from proof-of-work—used by bitcoin—and toward others such as proofof-stake. For example, the ethereum blockchain is currently transitioning to a proof-of-stake mechanism. The Ethereum Foundation believes that this switch will reduce the network's total energy consumption by at least 99.95%.⁵

^{4: &}quot;Bitcoin Uses More Electricity Than Many Countries. How Is That Possible?" The New York Times, Jon Huang, Claire O'Neill, and Hiroko Tabuchi, September 3, 2021. 5: "Ethereum's Energy Usage Will Soon Decrease by ~99.95%," The Ethereum Foundation, Carl Beekhuizen, May 18, 2021.

Moreover, most altcoins—a term used to describe any token distinct from bitcoin—rely on energy-efficient consensus mechanisms. Technical factors aside, it remains unlikely that the US government would act to constrain energy usage for crypto applications. US policymakers are more likely to see blockchain development as an economic moat that is worth protecting in the face of geopolitical competition, a view somewhat supported by President Biden's recent executive order to further research the potential of cryptocurrencies. At a more local level, business-friendly havens, such as Miami, are attracting far greater degrees of investment, making strict regulations on blockchain energy usage unlikely.

Interoperability solutions will be vital to scale up blockchain adoption and utility. Though

blockchains such as bitcoin and ethereum receive outsized media attention, dozens of other blockchain projects have emerged in the past few years, each with their own unique variations. The helium blockchain, for example, was developed to help facilitate decentralized wireless infrastructure in an age of billions of connected devices. It uses a unique consensus mechanism, proof-of-coverage, and its tokenomics model prescribes a maximum number of tokens, similar to bitcoin but different than ethereum. Beyond this, a variety of protocols have also emerged to help scale blockchain utility, such as transactions per second, interoperability, and smart contracts.

With so much activity happening in so many different places, interoperability will be key to help scale greater adoption of blockchain. Numerous Layer 2 solutions have garnered venture backing, including Immutable for NFTs, which raised \$200.0 million in Series C funding; Multichain's cross-chain router protocol, which raised \$60.0 million in seed funding; and

Terraform Labs for stablecoins, which raised \$150.0 million in early-stage VC. More users on Layer 1 platforms have slowed transaction speeds across blockchains, which have technical limitations that make scaling difficult.

There were approximately 295 million crypto users globally by the end of 2021, a 178% increase from the 106 million users measured at the beginning of the year.⁶ Ethereum dominated annual total value locked, which measures the value of crypto assets committed to a given protocol. Despite ethereum's substantial first-mover advantage, it did lose significant market share to several other emerging protocols, such as Solana, Avalanche, and Terra, over the course of 2021. As more of these projects become viable and attractive to developers, interoperability will increase in importance. Platforms that offer interoperability, especially to ethereum's sizable network of developers and users, increase the overall value of their ecosystem.

Geopolitical instability will propel blockchain adoption. As events in Ukraine have highlighted, geopolitical instability has prompted countries to increasingly turn toward unconventional means to gain a competitive advantage—and crypto has emerged as one of those tools. Within a week of Russia's invasion, the Ukrainian government raised more than \$42 million in cryptocurrency, using the funds to buy various supplies, such as bulletproof vests, medical equipment, and drones.⁷ Ukraine, which already has a track record in its exploration of blockchain's potential, is doubling down on the technology to raise funds and boost morale. The government also announced an NFT sale intended to support the armed forces.⁸

^{6: &}quot;Crypto Market Sizing," Crypto.com, January 2022. 7: "Ukraine Asked for Donations in Crypto. Then Things Got Weird." The Washington Post, Nitasha Tiku and Jeremy B. Merrill. March 3. 2022. 8: "Ukraine Plans to Issue NFT Collection to Fund Armed Forces," Financial Times, Cristina Criddle, March 3, 2022.

INDUSTRY DRIVERS & OUTLOOK

Advocates of crypto point to these developments as an example of digital asset's importance and inevitability. Unfortunately, the same functionality that can rapidly drive funding into Ukraine may also enable Russia to evade Western governments' sanctions. Russian cryptocurrency activity has been used in the past to help hackers convert ransoms to hard currency, and US regulators are focusing on how to further constrain Russian crypto capabilities.⁹ Although it is unlikely that Russia will be able to entirely lean on crypto to replace financial flows disrupted through sanctions, it still represents a powerful tool that authoritarian governments can use to evade international condemnation. Authoritarian regimes in Russia, North Korea, and Iran are likely all exploring crypto solutions and funding hackers to disrupt and steal crypto assets from Western nations.

Cybersecurity risks still pose a major obstacle for blockchain stability, but mitigation is

improving. 2021 was an incredibly successful year for crypto hackers according to blockchain analytics company Chainalysis, headlined by North Korea's theft of almost \$400 million in digital assets across seven separate hacks.¹⁰ Headline hacks have been commonplace since the beginning of crypto enthusiasm, with some, such as The DAO and Mt. Gox, completely disintegrating the organizations they affected. While blockchains themselves have proven resistant to attack. many of the protocols and bridges built atop and between them, increasingly important due to interoperability, remain vulnerable to hackers. Wormhole, a bridge linking the ethereum and solana blockchains, was recently robbed of approximately \$320 million via an exploit involving wrapped ethereum.¹¹ Ethereum creator, Vitalik Buterin, has even gone on record suggesting that cross-chain solutions are not viable due to the immense security risks they entail.¹²

While such concerns should remain front and center for blockchain participants and developers, stories of prosecutorial success and recovery of digital assets are also becoming more abundant. Wormhole, which was the second largest DeFi hack, was eclipsed by a \$600 million hack of interoperability protocol Poly Network in August 2021. Despite this, the money stolen was quickly returned, with analysts suggesting that the attacker faced challenges in laundering the money, or perhaps wanted to help expose a security flaw.¹³ Either way, tools to retrace cybercrimes and pinpoint specific bad actors are improving, and organizations, such as the Federal Bureau of Investigation (FBI), are developing more sophisticated units to deal with such crimes. The Department of Justice (DOJ) recently announced the creation of a Virtual Asset Exploitation Unit designed to track and seize digital funds associated with illicit activity.¹⁴ Gartner predicts that by 2024, successful cryptocurrency thefts and ransomware attacks will drop by 30%.¹⁵

Regulation is coming but will be felt unevenly. SEC's Gary Gensler has been clear about his intentions in bringing the crypto sphere under greater oversight, saying that digital assets fit under the "broad remit" of the SEC and that the crypto market needs greater investor protections.¹⁶ Indeed, the SEC has been increasingly active since Gensler took command, recently announcing its intention to scrutinize the NFT market more closely, and most notably settling with crypto lending firm BlockFi for \$100 million for failing to register loan products.¹⁷

^{9: &}quot;Russia Eyes Sanctions Workarounds in Energy, Gold, Crypto," Associated Press, Fatima Hussein, March 1, 2022. 10: "North Korean Hackers Have Prolific Year as Their Unlaundered Cryptocurrency Holdings Reach All-time High," Chainalysis, January 13, 2022.

^{11: &}quot;More Than \$320 Million Stolen in Latest Apparent Crypto Hack," CNBC, MacKenzie Sigalos, February 2, 2022. 12: "We are the EF's Research Team," vbuterin, Reddit, January 7, 2022, Accessed March 7, 2022.

^{13: &}quot;Hacker Behind \$600 Million Crypto Heist Returns Final Slice of Stolen Funds," CNBC, Ryan Browne, August 23, 2021. 14: "FBI Eyes Ransomware Profits with New Cryptocurrency Crimes Unit," TechCrunch, Carly Page, February 18, 2022. 15: "Predicts 2022: Prepare for Blockchain-Based Digital Disruption," Gartner, Avivah Litan, Adrian Leow, Whit Andrews, Fabio Chesini, and Jeremy D'Hoinne, December 6, 2021.

^{16: &}quot;SEC Chairman on New Regulations on Cryptocurrencies and Climate Risk," The Wall Street Journal, December 12, 2021. 17: "BlockFi, a Crypto Firm, Reaches a \$100 Million Settlement for Failing to Register Loan Products," The New York Times, Emily Flitter, February 14, 2022.

Though a more active SEC presents additional headaches for blockchain entrepreneurs, the policy landscape and nascence of the technology suggests that founders largely need not fear an overly heavy hand. For starters, crypto has plenty of allies in the policy sphere, even in some surprising places. US Senator from Oregon Ron Wyden, a powerful Democratic voice, warned his regulation-minded colleagues about tamping down innovation, saying, "I want to be on the side of the innovator."¹⁸ Mayor of Miami Francis Suarez and newly inducted New York City Mayor Eric Adams have gone out of their way to woo crypto entrepreneurs to their respective cities. More recently, President Biden's crypto executive order was received favorably by blockchain advocates, a signal that his administration would take the time to properly understand the complexities of blockchain before rushing into blunt force regulation.

It also appears that any regulation that the SEC or others have in mind will not be simple to formulate. Regulation has eluded authorities in part because of the seeming gray area that digital assets often inhabit-the commodity versus security debate. Some have suggested that, for at least the near future, regulation through litigation and enforcement, as occurred with BlockFi, will likely be the primary strategy employed by the SEC, rather than net new regulation. Others, such as the Center for American Progress, argue that statutes already exist that cover the activities of crypto companies.¹⁹ In reality, crypto advocates will likely prove at least somewhat successful in muddying the waters of enforcement, allowing blockchain entrepreneurs and investors more room to breathe as the industry matures.

Decentralization will be a means, not an end, to the next wave of internet innovation. Utopian visions of a virtual world free from government interference have thrived in crypto culture since its early days. Today, while that ethos increasingly contends with the watchful eye of government regulators, much of its techno-libertarian animus continues to drive blockchain conversations. This is happening in decentralized autonomous organizations (DAOs). DAOs aim to upend traditional governance structures through the use of smart contracts, which consist of lines of code written atop the blockchain that self-execute when various predetermined conditions are satisfied. As a tool, they are engineered to promote more peer-topeer interactions, facilitating a degree of speed and automation not possible in the alternative reality that depends on third-party mediators.

Proponents of DAOs point to the phenomenon as evidence of a novel use of blockchain technology to democratize participation in traditionally centralized and exploitative business models. In one example, it is proposed that social media users in a DAO framework could vote on the functionality and policy decisions of the experience, and perhaps even share in any advertising revenue the community generated. Given that all information is on the blockchain, the rules of the community, token ownership, and DAO participation would be fully transparent. Many DAO models aim to capture this model of governance, hoping that new DAOs powered by the blockchain can offer users more personal and economically fair experiences than the Web2 economy.

^{18: &}quot;Senior Democrat Warns Against Tough Clampdown and Crypto," Financial Times, Kiran Stacey, March 7, 2022. 19: "Congress Must Not Provide Statutory Carveouts for Crypto Assets," Center for American Progress, Todd Phillips and Alexandra Thornton, March 1, 2022.

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As with any idealistic vision, there are inevitably cracks in the facade. Though smart contracts functionally ensure greater speed in interactions, the general development of a DAOs rules and incentives are often hostage to the glacial negotiations that often occur among large groups with complicated incentives. In other words, democratization taken to its extreme can lead to decision paralysis. Moreover, many DAOs are structured around common operating procedure, but may not anticipate unexpected edge cases. If a business has a highly decentralized decision-making apparatus, and a surprising problem comes along, it will likely not have been foreseen by any smart contract architecture, and new solutions will have to be devised communally, an aforementioned slow process. Indeed, this has already led to the collapse of a variety of DAOs.

Framing this innovation in absolute terms—centralization versus decentralization—is of course unfair. Though DAOs are struggling to find the right balance of governance, many believe that DAOs in some form have a place in a variety of business organizations today. DAOs can be leveraged to encompass a user base while still assigning central decision-making authority to a limited group of stakeholders. Moreover, the infrastructure underpinning DAOs is flexible enough to allow for different types of rule sets to emerge that work best in different situations, though certainly some standard "templates" are likely to emerge. Those interested in DAOs and decentralization should not view them as an end to hierarchy, but rather a flattening of the pyramid.

VC activity



Source: PitchBook | Geography: Global | *As of March 15, 2022







Source: PitchBook | Geography: Global | *As of March 15, 2022

Source: PitchBook | Geography: Global | *As of March 15, 2022

VC ACTIVITY

Figure 5.

Notable blockchain VC deals*

COMPANY	DEAL SIZE (\$M)	CLOSE DATE	REGION	SUBSEGMENT
MoonPay	\$555.0	November 22, 2021	North America	Crypto trading
Gemini	\$400.0	November 18, 2021	North America	Crypto trading
Compute North	\$385.0	February 9, 2022	North America	Mining infrastructure
Aleo	\$200.0	February 7, 2022	North America	Developer tools
Blockdaemon	\$207.0	January 26, 2022	North America	Institutional infrastructure
SEBA Bank	\$119.6	January 12, 2022	Europe	Crypto exchange
Rain	\$111.9	January 12, 2022	Middle East	Crypto trading
Zero Hash	\$105.0	January 5, 2022	North America	Crypto infrastructure
Mercado Bitcoin	\$250.3	November 30, 2021	South America	Crypto exchange
Axie Infinity	\$152.0	October 5, 2021	Asia	Blockchain gaming

Source: PitchBook | Geography: Global | *As of March 7, 2022

Blockchain VC ecosystem market map

Click to view interactive market map on the PitchBook Platform

Market map is a representative overview of venture-backed or growth-stage providers in each segment. Companies listed have received venture capital or other notable private investments.

Infrastructure		Finance	NFTs
-• Developer tools	-• Digital identity	 Trading & exchanges 	- Art
	evernym ShareRing metamer ficonloop	FTX OBlockFi Celsius Dunamu	ARTO
-• Data & analytics	-• Regtech	 Institutional platforms & services 	- Infrast
Chainalysis Covalent Synchrony	77AXbit ELLIPTIE Spring 🔆 TRM Shyft	Fireblocks	🖨 name
-• Security & privacy	-• Hardware	- Infrastructure	- Collec
♥ brave ♥ □ □ □ □ □ □ □ □ □ ★ Forta ♦ Aztec Ŷ SpiderOak	LEDGER BITFURY		⊛sorc
Blockchains	-• Mining	→ Wallets	- Marke
Belium Salana Salana Salana		Serverterium 🗲 WYRE 🥑 imToken 💈 ZenGo	🕗 Ope
Enterprise	Smart contracts	- DeFi	- Gamir
-• Healthcare	Ava Labs. tenderly Assembly OBATA GUMBO	Vour DeFi Wallet Set TokenSets Arr Fei Protocol	FOR
		- Real estate	- Metav
-• Supply chain		FIGURE RealtyBits	TOGETTHE
Aggromatin GRANN farmer Connect		Data & analytics	Entert
Other		◆nonsen 🌣 amberdata → OKLink 🍞	ŦHEŢ
ISI Permission* IN BlockApps Shelter			

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Blockchain taxonomy

Enterprise

Startups in this segment are developing blockchain solutions for enterprise-focused use cases.



Healthcare: Startups developing blockchain solutions for healthcare organizations in areas such as life sciences and clinical trials, among others.



Supply chain: Startups developing supply chain solutions using blockchain, solving problems such as traceability in agriculture.



Other: Startups developing a variety of blockchain solutions targeted toward enterprise use cases.

Finance

Startups in this segment are either providing financial services using decentralized blockchain infrastructure or developing said infrastructure to facilitate financial services.



Trading & exchanges: Startups in this category help facilitate cryptocurrency transactions, either through the development and operation of crypto exchanges or through the creation of crypto trading applications.



Infrastructure: Startups in this category are developing blockchain infrastructure designed to facilitate financial transactions.



services.





Phantom

Institutional platforms & services: Startups in this category are providing financial services to institutions or developing blockchain platforms to be used by institutional stakeholders.

Wallets: Startups in this category are developing and operating crypto wallets.

Real estate: Startups in this category are providing various blockchain services in the real estate industry.

Infrastructure

FIGURE

Startups in this segment are developing software to help facilitate and improve blockchain efficacy.



Blockchains: Startups in this category are developing novel blockchains using distributed ledger technology.



DeFi: Startups in this category are providing decentralized financial

Data & analytics: Startups in this category are providing financial data and analytics of decentralized financial transactions.

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Aalchemy

Developer tools: Startups in this category are developing protocols, layer solutions, SDKs, APIs, and a variety of other software solutions to help with problems such as blockchain efficacy, scalability, and interoperability.

Mining: Startups in this category are developing infrastructure to support the mining required to power various blockchains, primarily bitcoin.

77AX bit

COMPUTENORTH[®]

Regtech: Startups in this category are providing various regulatory and compliance solutions to the blockchain ecosystem in areas such as tax compliance and anti-money laundering.

e*ernym

Digital identity: Startups in this category are developing digital identity solutions using blockchain technology that aim to facilitate more trusted transactions.



Hardware: Startups in this category are developing various hardware solutions for blockchain problems, such as cryptocurrency security.



Smart contracts: Startups in this category are developing smart contract software and solutions with the aim of promoting the automated settlement of legal contracts.

Chainalysis



data and analytics solutions.

Security & privacy: Startups in this category are developing security and privacy solutions on top of existing blockchains.

NFTs

Startups in this segment are developing ecosystems that promote the use of NFTs.

ARTORY

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Art: Startups in this category are developing NFT products that facilitate the exchange of physical and digital art.

Collectibles: Startups in this category are developing NFT products that facilitate the exchange of physical and digital collectibles.

Gaming: Startups in this category are incorporating NFT technology into video games, enabling new business models such as play-toearn.

Entertainment (non-gaming): Startups in this category are developing NFT experiences related to entertainment categories such as sports and music, among others.

Data & analytics: Startups in this category are providing blockchain

BLOCKCHAIN TAXONOMY

ameless^{*}

Infrastructure: Startups in this category are developing software solutions such as developer tools, protocols, scalability, and interoperability solutions that aim to promote the usage and feature set of NFTs.



Marketplaces: Startups in this category are developing and operating exchanges meant to help mint and trade NFTs.



Metaverse: Startups in this category are developing NFT experiences related to the evolving metaverse.

Key players

Figure 6.

Key angel & seed blockchain companies

COMPANY	SEGMENT	GROWTH THEME	PRODUCT FOCUS	GEOGRAPHY	TOTAL VC RAISED (\$M)*
Salad Ventures	Entertainment	Metaverse & blockchain gaming	N/A	Asia	\$15.5
Ethernity	NFTs	Metaverse	N/A	North America	\$23.4
New Sin City	NFTs	Blockchain gaming	Play-to-earn games	North America	\$40.0
Conduit	Finance	DeFi	Infrastructure (APIs)	North America	\$17.0
Redefine Technologies	Finance	DeFi	Risk management	Middle East	\$14.0
Heir	NFTs	Collectibles	Sports	North America	\$11.O
POOIs	NFTs	Creator economy	N/A	North America	\$18.0
Ardana App	Finance	DeFi	Stablecoins	Europe	\$10.0
Moralis	Infrastructure	Web3	APIs for dApps	Europe	\$13.4
Flux Protocol	Infrastructure	Web3	Cross-chain Oracle	Europe	\$11.3

LAST FINANCING DATE

February 11, 2022

February 10, 2022

January 19, 2022

January 13, 2022

January 5, 2022

December 16, 2021

December 1, 2021

October 29, 2021

September 13, 2021

May 20, 2021

Source: PitchBook | Geography: Global | *As of March 7, 2022

Figure 7.

Key early-stage blockchain companies

COMPANY	SEGMENT	GROWTH THEME	PRODUCT FOCUS	GEOGRAPHY	TOTAL VC RAISED (\$M)*
Dune Analytics	Finance	Blockchain data	Data & analytics	Europe	\$79.4
Pixel Vault	NFTs	Collectibles	Comics	North America	\$100.0
Phantom	Finance	Crypto & NFTs	Crypto exchange & wallet	North America	\$118.0
The Graph	Infrastructure	Web3	APIs	North America	\$57.5
Ramp	Finance	Crypto trading	Infrastructure	Europe	\$65.2
Metaversal	NFTs	Metaverse	NFT investment	North America	\$50.0
Autograph	NFTs	Collectibles	Sports, entertainment, & culture	North America	\$205.0
Nansen	Finance	DeFi	Data & analytics	Asia	\$88.2
SolChicks	NFTs	Blockchain gaming	Play-to-earn games	Asia	\$77.0
Terraform Labs	Finance	DeFi	Infrastructure	Asia	\$207.0

Source: PitchBook | Geography: Global | *As of March 7, 2022

LAST FINANCING DATE
February 2, 2022
February 2, 2022
January 31, 2022
January 21, 2022
December 15, 2021
January 4, 2022
January 4, 2022
December 13, 2021
March 2, 2022
July 19, 2021

Figure 8.

Key late-stage blockchain companies

COMPANY	SEGMENT	GROWTH THEME	PRODUCT FOCUS	GEOGRAPHY	TOTAL VC RAISED (\$M)*
Immutable	Infrastructure	NFTs	APIs	Australia	\$305.0
Helium	Infrastructure	Wireless networks	Blockchain	North America	\$253.8
Alchemy	Infrastructure	Web3	Developer tools	North America	\$413.6
FTX	Finance	Crypto trading	Crypto exchange	North America	\$1,870.0
Fireblocks	Finance	Crypto trading	Insitutional Infrastructure	North America	\$1,230.0
Forte	NFTs	Blockchain gaming	Developer tools	North America	\$954.6
NEAR Protocol	Infrastructure	Interoperability	DApp platform	North America	\$171.6
OpenSea	NFTs	Digital ownership	Marketplace	North America	\$423.1
Anchorage Digital	Finance	Crypto trading	Institutional infrastructure	North America	\$487.0
Figment	Infrastructure	Web3	Developer tools	North America	\$165.0

Source: PitchBook | Geography: Global | *As of March 7, 2022

LAST FINANCING DATE
March 7, 2022
February 18, 2022
February 8, 2022
January 31, 2022
January 27, 2022
January 20, 2022
January 13, 2022
December 27, 2021
December 15, 2021
December 10, 2021

Figure 9.

Notable blockchain investors

COUNT	COUNT	COUNT	INVESTOR TYPE	
51	90	13	CVC	
46	67	1	VC	
45	57	0	VC	
24	48	17	CVC	
23	47	19	VC	
32	48	9	VC	
10	57	18	VC	
33	49	1	VC	
34	40	3	VC	
29	46	1	VC	
	COUNT 51 46 45 24 23 32 10 33 34 29	COUNT COUNT 51 90 46 67 45 57 24 48 23 47 32 48 10 57 33 49 34 40 29 46	COUNT COUNT COUNT 51 90 13 46 67 1 45 57 0 24 48 17 23 47 19 32 48 9 10 57 18 33 49 1 34 40 3 29 46 1	COUNT COUNT COUNT INVESTOR TYPE 51 90 13 CVC 46 67 1 VC 45 57 0 VC 24 48 17 CVC 32 47 19 VC 10 57 18 VC 33 49 1 VC 34 40 3 VC

Source: PitchBook | Geography: Global | *As of March 7, 2022

Figure 10.

Notable blockchain investors (cont.)

Fenbushi Capital 74 25 42 7 VC	
Dragonfly Capital Partners 65 25 36 4 VC	
CMT Digital 63 21 28 14 VC	
Shima Capital 63 26 36 1 VC	
Kenetic Capital 63 26 31 6 VC	
Jump Capital 58 19 31 8 VC	
Coinfund 55 29 24 2 VC	
Blockchain Capital 55 12 38 5 VC	
Spark Digital Capital5517362VC	
DeFiance Capital 54 27 26 1 VC	

Source: PitchBook | Geography: Global | *As of March 7, 2022

Key acquisitions

Nike acquires RTFKT for an undisclosed amount on December 13, 2021.

Nike made perhaps the boldest splash into blockchain technology among non-tech corporates with its acquisition of RTFKT Studios, a startup that develops digital sneakers and collectibles in the NFT ecosystem. The move follows Nike's established pattern of integrating with digital experiences as a way to evolve the brand and retain cultural relevancy. A 2019 partnership with Epic Games' Fortnite saw Nike Air Jordans enter the game as a purchasable microtransaction.²⁰ It has been suggested that RTFKT's technology could allow Nike to sell sneakers with an associated NFT, a physical-digital hybrid business model that would enable consumers to extend the utility of their shoe purchases into the digital world. From a larger lens, the acquisition likely foreshadows more partnerships or acquisitions between blockchain and metaverse startups and traditional corporates. Companies are already seeing the vast amount of time and money spent in digital ecosystems, especially by younger consumers. As cultural norms around digital ownership and engagement continue to evolve, not having an established presence in popular digital ecosystems could spell disaster.

Blockdaemon acquires Gem for an undisclosed amount on March 9, 2022.

Shortly after Blockdaemon raised a \$207 million Series C in January, the enterprise infrastructure company scooped up smaller infrastructure player Gem. Blockdaemon, which focuses on staking, scaling, and deploying nodes for institutional clients, can expand their operations with clearer transaction data and transaction-based revenue. Growth in decentralized finance and proof-of-stake validation has seen billions of dollars flow into financial infrastructure companies such as Blockdaemon. This consolidation demonstrates how the sector is slowly beginning to mature, empowering Blockdaemon to offer a greater suite of services to institutional clients.

20: "Air Jordans Come to Fortnite in Nike Partnership," Polygon, Austen Goslin, May 22, 2019.

OpenSea acquires Dharma Labs for an undisclosed amount on January 18, 2022.

OpenSea, by far the highest-capitalized NFT marketplace, has made an investment in both talent and functionality with its acquisitions of Dharma Labs. Notably, Dharma Labs cofounder Nadav Hollander will become OpenSea's CTO, while the previous CTO will remain onboard to work on NFT ecosystem development.²¹ Dharma made a name for itself in the DeFi space by simplifying the process of on-ramping from fiat currency into crypto, functionality that OpenSea is keen to replicate with its NFT products. Though more competitors are emerging, OpenSea still dominates transaction volumes, and reducing barriers from fiat currency to NFTs will help to secure more users in an already supercharged space. Especially if NFT volume cools, such as during a crypto winter, OpenSea would have a big advantage as the largest incumbent and now with even easier transaction tools.

Celsius Network acquires GK8 for \$115 million on November 2, 2021.

Given the alarming number of cybersecurity vulnerabilities in the crypto industry, it was a savvy move for crypto lending platform Celsius to snap up GK8, an Israeli blockchain security company. GK8 uses a technique called "air gapping," which claims to facilitate blockchain transactions with no direct internet connectivity, something that, in theory, makes hacking far more difficult. The company is so confident in its technology that it put out a bounty to hackers in early 2020 with an award for breaking into their system.²² Celsius, which offers crypto lending and exchange services to both individuals and institutions, now has a veteran cybersecurity unit under its wing. The acquisition should make the platform more appealing to institutional clients, especially those wary of expanding into digital assets due to the cybersecurity risks.

^{21: &}quot;OpenSea Buys DeFi Wallet Startup Dharma Labs, Appoints New CTO," TechCrunch, Lucas Matney, January 18, 2022. 22: "Security Firm GK8 Offers Up to \$250K in Bitcoin If Someone Hacks Its Cold Wallet," The Block, Yogita Khatri, January 27, 2020.

Blockbuster funds

andreessen. horowitz	🕼 Paradigm	FTX Ventures	ELECTRIC+CAPITAL	SEQUOIA 🖳	PANTERA	Multic
KEY PEOPLE:						
Chris Dixon	Matt Huang & Fred Ehrsam	Amy Wu	Avichal Garg	Michelle Bailhe, Shaun Maguire, Alfred Lin	Paul Veradittakit	Kyle
RECENT CRYPTO F	UNDRAISES:*					
\$4.5 billion	\$2.5 billion	\$2 billion	\$1 billion	\$600 million	\$600 million	\$25
FUND ALLOCATION	1:					
			■Infrastructure ■ Finan	ce NFTs Enterprise		





BLOCKBUSTER FUNDS

Overview of key themes

NFTs

Non-fungible tokens (NFTs) are unique digital records stored on a blockchain, typically representing claims on physical or digital assets separate from currencies. NFTs can be sold, traded, or referenced to prove ownership of assets such as music, land, digital items, and videos, among others.

Figure 11.

Taxonomy



Figure 12.

Top startups

COMPANY	CATEGORY	TOTAL RAISED (\$M)*	LAST FINANCING DATE	LAST FINANCING TYPE	
FORTE	Blockchain gaming	\$954.6	January 20, 2022	Early-stage VC	
⊛ sorare	Collectibles	\$738.0	September 20, 2021	Series B	
🕗 OpenSea	NFT marketplace	\$423.1	December 27, 2021	Series C	

Source: PitchBook | Geography: Global | *As of March 7, 2022



Source: PitchBook | Geography: Global | As of March 15, 2022

OPPORTUNITIES	CHALI
 Increasing investment into metaverse-related technologies such as augmented and virtual reality, social media, gaming, and blockchain. 	• SE NF reg • Int
 Physical/digital combinations, such as those piloted by Nike, could allow consumers to have a permanent digital record of physical transactions. 	tra • NF on de
 Cultural norms are evolving to put a greater emphasis on digital ownership. 	• NF vul wh the fur

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C regulation may treat some Ts as investment contracts, gulating them as securities.

eroperability challenges may it where and how NFTs can be aded, dampening their appeal.

Ts remain highly focused art and collectibles, not yet monstrating wider applications.

T projects have been highly Inerable to "rug pull" schemes, in nich stakeholders abruptly cancel e project and abscond with nds.

DAOs

Decentralized autonomous organizations (DAOs) are organizations that use smart contracts maintained on blockchains to govern interactions between users, group incentives and outputs, and membership conditions. DAOs represent a departure from traditional hierarchical organizations in that control and decision making need not be highly centralized, and interactions among group members are largely facilitated via governance token ownership and voting.

Figure 13.

Top startups

COMPANY	CATEGORY	TOTAL LAST FINANCIN RAISED (\$M)* DATE		LAST FINANCING TYPE	
ALLIANCE	DeFi	\$50.0	January 14, 2022	Early-stage VC	
TRIBUTE	DAO tooling	\$20.0	February 1, 2022	Series A	
Perion	NFT gaming	\$20.6	January 27, 2022	Early-stage VC	
Source: PitchBook Geography: Global *As of March 7, 2022					

 46 69 \$28 corrections COPORTUNITIES Flattening organizational hierarchies, enabling participants to have greater say in an ecosystems policies and priorities. Democratizes ownership and revenues through the distribution of tokens in a bespoke tokenomics model. Improved transparency around organizational policies and participation, enabling greater trust among users in the ecosystem. 	COMPANIES		TOTAL DEALS		INV
 Source: PitchBool CPPORTUNITIES Flattening organizational hierarchies, enabling participants to have greater say in an ecosystems policies and priorities. Democratizes ownership and revenues through the distribution of tokens in a bespoke tokenomics model. Improved transparency around organizational policies and participation, enabling greater trust among users in the ecosystem. 	46		69		\$28
OPPORTUNITIES CHAL • Flattening organizational • Pathers hierarchies, enabling participants ca to have greater say in an pressure ecosystems policies and priorities. ag • Democratizes ownership and • DA revenues through the distribution of tokens in a bespoke tokenomics model. • Sm • Improved transparency around ev organizational policies and participation, enabling greater trust among users in the co ecosystem. co				Source	e: PitchBool
 Flattening organizational hierarchies, enabling participants to have greater say in an ecosystems policies and priorities. Democratizes ownership and revenues through the distribution of tokens in a bespoke tokenomics model. Improved transparency around organizational policies and participation, enabling greater trust among users in the ecosystem. 	OPPORTUNITIES	;			CHAL
	 Flattening org hierarchies, en to have greate ecosystems p Democratizes revenues thro of tokens in a model. Improved tran organizationa participation, trust among u ecosystem. 	ganizat nabling er say i olicies owner ugh th bespo sparer I polici enablin isers in	ional g participants n an and priorities. Tship and e distribution ke tokenomics ncy around es and ng greater the		 Pa cal pro ag DA tha fac Sm evo tha sm col

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articipant apathy or intrasigence an slow the decision-making rocess, reducing organizational ility.

AO tooling, the infrastructure at enables DAOs to function and cilitate tokenomics, is immature.

mart contracts cannot predict very possible scenario, meaning at edge cases not foreseen by hart contract rules can create omplications.

Developer tools

Developer tools refers to blockchain software such as protocols, Layer X solutions, APIs, and SDKs that help to facilitate interoperability, scalability, and more robust functionality within and between blockchains.

Figure 14.

Top startups

COMPANY	CATEGORY	TOTAL RAISED (\$M)*	LAST FINANCING DATE	LAST FINANCING TYPE	
A alchemy	Developer platform	\$413.6	February 8, 2022	Series D	
🕅 immutable	E Layer 2 for \$305 NFTs		March 7, 2022	Series C	
O the graph	Inde APIs	\$57.5	January 21, 2022	Early-stage VC	

Source: PitchBook | Geography: Global | *As of March 7, 2022

TOTAL COMPANIES	TOTAL DEALS	TOTAL INVE
73	194	\$2

OPPOF

Source: PitchBook | Geography: Global | As of March 15, 2022

OPPORTUNITIES	CHALI
 Interoperability solutions are 	• Sor
vital to help grow the blockchain	not
ecosystem and uphold the tacit	abo
mandate of decentralization.	of
 Significant crypto user growth 	sec
in 2021 points to the impending	• Ree
need for these solutions. As a	sol
result, VC funding into blockchain	ter
infrastructure startups has led all	wh
categories in 2022 so far.	wh
Greater institutional participation	
is accelerating the maturity	
and adoption of blockchain	

infrastructure. Leading institutional players will help to expedite the consolidation of developer tools.



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me industry participants, tably Vitalik Buterin, skeptical out the long-term viability cross-chain solutions due to curity risks.

dundancy and over-engineered lutions are likely in the short rm given uncertainty about ich blockchains will thrive in nich instances.



About PitchBook Emerging Tech Research

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