



Digital Assets 2023

Identifying the opportunities
across the enterprise landscape

ZUMO[®]

Digital Assets 2023

Community voices

In the spirit of collaboration that has driven the growth of our nascent sector, this insights report was supported by a series of interviews and invited comment from a range of expert contributors across the digital asset and financial services industries.

Selected abridged excerpts are featured as attributed comment alongside the narrative of this report, with a full list of contributors and comments included in appendix.



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Executive summary

This unique insights report is the **first to comprehensively survey and analyse** the emerging areas of opportunity within the global digital asset ecosystem from an enterprise perspective.

Targeted to companies, organisations and financial institutions with an interest in the practical application of digital assets in their own business, it provides a **filtered overview** of the digital asset landscape based on **expert contributions** from some of the industry's largest enterprises, solutions providers, and independent analysis.

At a glance

- We **trace the evolution of blockchain from an enterprise perspective**, identifying four turning points characteristic of a progressive broadening in digital asset applications and participants.
- We use this to construct an **enterprise ecosystem map** distinguishing consumer-facing and institutional-facing solutions, and investment versus applied use cases.
- **We conclude that 4.0 is the first truly 'enterprise era'**, in which enterprise has access to, and is active across, all four quadrants of digital asset opportunity.
- We continue on to assess the **opportunities, challenges and inter-relationships associated with nine individual use cases**, which we categorise according to our framework as **early** (institutional digital asset investment; institutional DeFi; web3); **developing** (tokenisation; blockchain in industry; DLT for financial market infrastructure) and **established** (consumer-facing cryptoasset investment; and individual/business blockchain payments).

The reader is welcome to browse individual chapters according to their area of interest, or read in sequence as a helicopter guide to the entire digital asset space.

Summary findings

- On **consumer-facing investment solutions (ch.1)**, we find that consumer entry routes into cryptoasset investment have **diversified significantly**, with a timeline of increasing participation from institutions and wealth managers.
- On **consumer payments (ch. 2)**, we find that cryptoassets and stablecoins for payments represent one of the **most proven areas of utility**, but increasingly compete with emerging tokenised deposit and central bank digital currency (CBDC) explorations (which currently remain significantly behind in adoption).
- On **web3 (ch. 3)**, we find that brands continue to **embrace web3 opportunities** and are now actively generating royalties and revenues.
- On **tokenisation (ch. 4)**, we find an emerging cluster of **renewed activity and active project development** around tokenisation of existing financial asset classes.
- On **business payments (ch. 5)**, we find that businesses continue to **explore digital asset payments rails** for treasury and cross-border payments, with a willingness to embrace CBDC payments methods in the future.
- On **blockchain in industry (ch. 6)**, we find that current development is **led by financial market infrastructure and public sector narratives**, together with an active strand of interest in blockchain applied to energy & environment.
- On **financial market infrastructure (ch. 7)**, we find an ongoing diversity of **efficiency-focused initiatives** that includes some of the largest active DLT projects.
- On **institutional asset investment and management (ch. 8)**, we find **increasing institutional digital asset investment engagement** on both buy and sell sides, with increasingly institutionally-driven trading markets.
- On **Institutional DeFi (ch. 9)**, we find an **openness to integrate and engage** with DeFi concepts in an institutional setting, including an uptake in institutional staking and pilot applied CBDC + tokenisation projects.

Introduction

Categorising the enterprise landscape

Blockchain and the slope of enlightenment

¹ By 'enterprise' we mean any non-crypto-native business or public organisation seeking to integrate digital assets and/or blockchain technology into its operations.

² [Deloitte Global Blockchain Survey](#), figures 1 and 2.

Digital assets, and blockchain more broadly, are an area of keen enterprise¹ interest, with roughly four in five players believing that digital assets will be very or somewhat important to their respective industries in the next 24 months; and that there is a compelling business case for the use of blockchain, digital assets and/or cryptocurrencies within their organisation.²

What exact shape that implementation may take is less clear.

Characteristically of a young and rapidly evolving technology and sector, the digital asset landscape of today is an overwhelming, often overlapping array of terminology and associated hype that can make it highly challenging to cut through the noise and formulate effective digital asset strategies.

From tokenisation to decentralised finance, central bank digital currency to distributed ledger technology, NFTs to web3, the terms thrown around are many. But what is pure hype? What is a (comparatively) matured solution? And where are the probable next areas of opportunity?

From the enterprise perspective, the problem is one of range, focus and application. That is to say, how to compare the sheer breadth of terrain that has emerged between, say, a bank employing a private blockchain for its own internal operations; a retail commerce brand offering a NFT loyalty programme to its customers; or a fintech offering a merchant-targeted blockchain-based payment system?

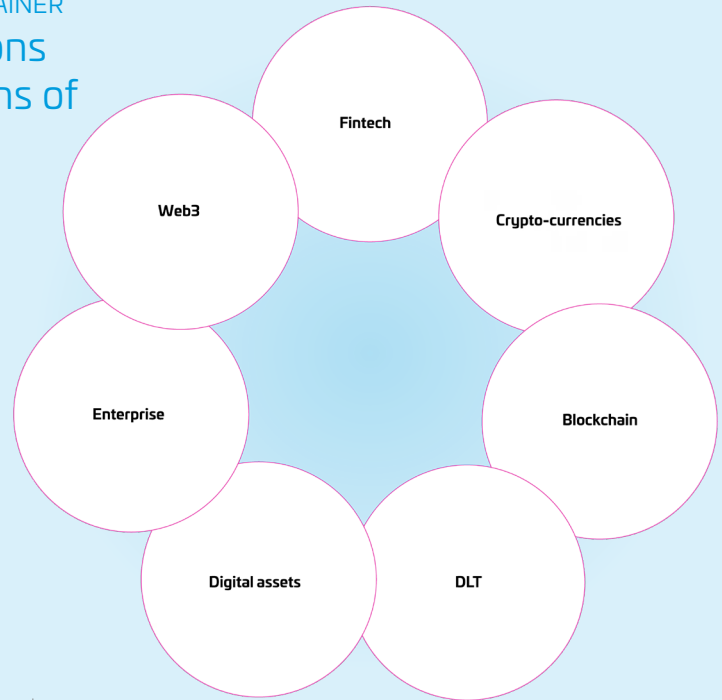
Determining where opportunities lie, how they interrelate, and how they support – or indeed challenge – one another relies on a big-picture understanding of the digital asset and blockchain ecosystem as seen from the holistic enterprise perspective. And, in a landscape in which lines between definitions and target audiences have frequently become blurred, this is precisely what enterprises often lack as the starting point for their own digital assets strategies and assessment.

With this report, we aim to provide a deliberately enterprise-focused overview that takes thorough stock of the current enterprise landscape and categorises current and emerging opportunities according to a deliberate taxonomy, giving shape to the enterprise picture and flagging individual areas of interest according to their relevance, maturity and scope of commercial/technology opportunity.

The wider story of digital assets in recent years has been one of inflated expectations and disillusionment alike: if we are to ascend the slope of enlightenment, it will be against the backdrop of a robust categorisation and realistic assessment of opportunities and viable longer-term use cases; an understanding of how those applications fit into the wider enterprise landscape; and a strategic appreciation for the possibilities and limitations of each.³

³ Terminology from the [Gartner hype cycle](#).

TERMINOLOGY EXPLAINER
 Short definitions
 and distinctions of
 terminology
 referenced in
 this report



Term	Description
Crypto-currency	A cryptographically engineered form of digital money designed specifically for payments and store of value.
Crypto	The common shorthand and umbrella term for the whole spectrum of investable cryptoassets.
Blockchain	The underpinning data structure that facilitates cryptocurrency: i.e. cryptocurrency is a particular application of blockchain.
Distributed Ledger Technology (DLT)	An even broader term than blockchain that has the same distributed features (a network of validating machines) but does not by default imply the block-based structure of a blockchain. Often associated with private/permissioned contexts.
Digital assets	Taken tongue-in-cheek, a reference term for investable cryptoassets, but in the institutional setting; otherwise, a still broader term than DLT that represents emerging virtual assets such as central bank digital currency (CBDC) that may not even run on DLT technology as well as entirely new emerging categories of digital asset, such as tokenised equities and bonds.
Enterprise	A reference term for any non-crypto-first business, organisation or public institution active in any area of the digital asset space.
Web3	An analogue to crypto, but situated in the context of providing wider and more encompassing utility and generalised applications in the online world.

Towards a framework for digital assets for enterprise

To come up with a cohesive framework of the enterprise digital assets landscape as it exists today, we have to go back to the very beginning and ask the question: how did ‘crypto’ merge into ‘digital assets’ into ‘digital assets for enterprise’ in the first place?

In answer, we propose two main axes of evolution: from monetary investment towards progressively more generalised and applied use cases; and from the individual towards progressively more institutionalised offerings.

One way to think about this is in terms of ecosystem iterations, and the evolutions in participants and application that characterised each.⁴

⁴ It is worth emphasising, these blockchain iterations shouldn't be understood as replacing each other or forming a chronological sequence where one flows into and displaces the other. Rather, they are all current (though obviously differing in maturity, focus and context) and have layered and intertwined on top of each other to form the landscape we have today.

⁵ For which we need read no further than the title of the original Bitcoin white paper (emphases added): ‘Bitcoin: a **peer-to-peer** electronic **cash** system’.

⁶ Simple definition [here](#).

⁷ Prominent examples of which include, for instance, the Enterprise Ethereum Alliance, R3 consortium and Hyperledger Foundation.

⁸ For instance, the inauguration of Bitcoin futures trading on the Chicago Mercantile Exchange (CME).

Blockchain 1.0

is the Bitcoin blockchain: crypto’s big bang moment for everything that came after. As a cryptographically engineered digital currency designed to facilitate transfer of value directly between individuals, it is (a) deeply and deliberately financialised, and (b) targeted to the individual user without intermediary.⁵ At this proto stage, there is no enterprise-side participation: ‘crypto(currency)’ is all there is.

Blockchain 2.0

is the Ethereum blockchain and the dawn of added programmability through smart contracts: embeddable (business) logic.⁶ This is the time when participants – including for the first time enterprise – realise that blockchain as a building block might be useful for a range of things supplementary to, and indeed beyond, that imagined in the original Bitcoin implementation. Accordingly, this is the era of the first enterprise blockchain consortia founded to examine commercial blockchain applications,⁷ as well as the first more sophisticated investment products.⁸ At this stage, the overall ecosystem is beginning to accrue both new participants and new applications, with an embryonic interest in blockchain from enterprises in diverse industries, mostly focused on blockchain experimentation for their own business operations (often financial) as well as the rapid emergence of additional financial infrastructure and investor participation beyond pure retail trading.

Blockchain 3.0

is the debut of the ‘web3’ phenomenon, and perhaps blockchain’s first innovation cycle within the ‘mainstream’. Through new verticals, such as decentralised finance, NFTs and wider conceptualisations of decentralised infrastructure, identity management and governance, blockchain 3.0 broadens the application envelope from blockchain 2.0 still further. This proves a Rubicon crossover point as, for the first time, emerging applications such as gaming, collectibles and digital ID mean that broad-based consumer applications for blockchain technologies are no longer restricted to purely financialised use cases. The commercial and adoption potential of this is huge, if overhyped, and triggers a period of [unprecedented venture capitalist investment](#) in promising emerging technology. This coincides with continued growth in institutional investment avenues that increasingly target professional and high-net-worth [investor demand](#) for ‘crypto’ investments. In institutional contexts, such solutions increasingly become referred to as ‘digital assets’.

Blockchain 4.0

is the enterprise era. Developing the trends observed in blockchain 3.0 – and perhaps to some extent stemming out of the culminating boom-bust cycle characterising it – blockchain 4.0’s key point of transition is enterprises’ and institutions’ direct participation in productisation and consumer service provision, and the growing influence of institutional forces across the digital asset landscape. Whereas in previous eras enterprise activity may have concentrated on businesses’ own operations, or a view of the overall cryptoasset space as an investable alternative technology sector, blockchain 4.0 brings brands, businesses and institutions – financial and public – directly into the ground previously the exclusive preserve of crypto-first or crypto-native businesses.⁹ Banks offer their own cryptoasset investment platforms. Established brands release their own NFT collections. Governments develop plans for their own digital currencies. This triggers a groundswell in supporting infrastructure and distribution channels, spurring new waves of initiative that spill to both sides of the institutional and consumer divide, forever blurring the boundaries between ‘crypto’ and everything else, and bringing closer integration between the ‘tradfi’ and blockchain worlds. At the same time, in what is still the very first innings of the ‘enterprise’ age, it belies the constantly evolving competition and dynamics that evolve between, for instance, private and public digital currencies; and individual versus enterprise-oriented visions of what the industry should ultimately become. A narrative comes into view.

⁹ Not to mention a renaissance in financial market infrastructure applications and institutionally-initiated digital currency and tokenisation projects.

Fig. 1:
An enterprise age?
Four proposed evolutions of blockchain development.

	c. 2009-present Blockchain 1.0	c. 2014-present Blockchain 2.0	c.2020-present Blockchain 3.0	c. 2022-present Blockchain 4.0
Driving application/narrative	Monetary	+ Programmability	+ Web3	+ (enterprise) integration
Participants	Individuals	+ companies (non-crypto)	+ hedge funds + VC + institutional financial services	+ brands & merchants + retail banks + government
Enterprise involvement	None	Embryonic	Early	Developing
Enterprise focus	None	Own-use business operations	Investment vehicle	Participation in product & service provision
Dominant blockchain mode	Public/permissionless	Public/permissionless	Public/permissionless	Public/permissionless + private/permissioned ¹⁰
Acceptance/permeation	Crypto users (individual): <5 million Blockchain market size (enterprise): 0 CBDCs issued (government): 0	Crypto users (individual): ~5 million (2016) Blockchain market size (enterprise): \$210.2 million (2016) CBDCs issued (government): 0	Crypto users (individual): ~106 million (Jan 2021) Blockchain market size (enterprise): ~\$1.43 billion (2020) CBDCs issued (government): 1	Crypto users (individual): ~402 million ¹¹ (Nov 2022) Blockchain market size (enterprise): ~\$10.41 billion ¹² (2022) CBDCs issued (government): 11 ¹³

¹⁰ Public/permissionless blockchains are open to anyone without restriction, while private/permissioned blockchains restrict access and rights to a select group of participants.

¹¹ Statista estimates.

¹² Estimates from ResearchGate / Expert Market Research.

¹³ Atlantic Council.

Source: Zumo

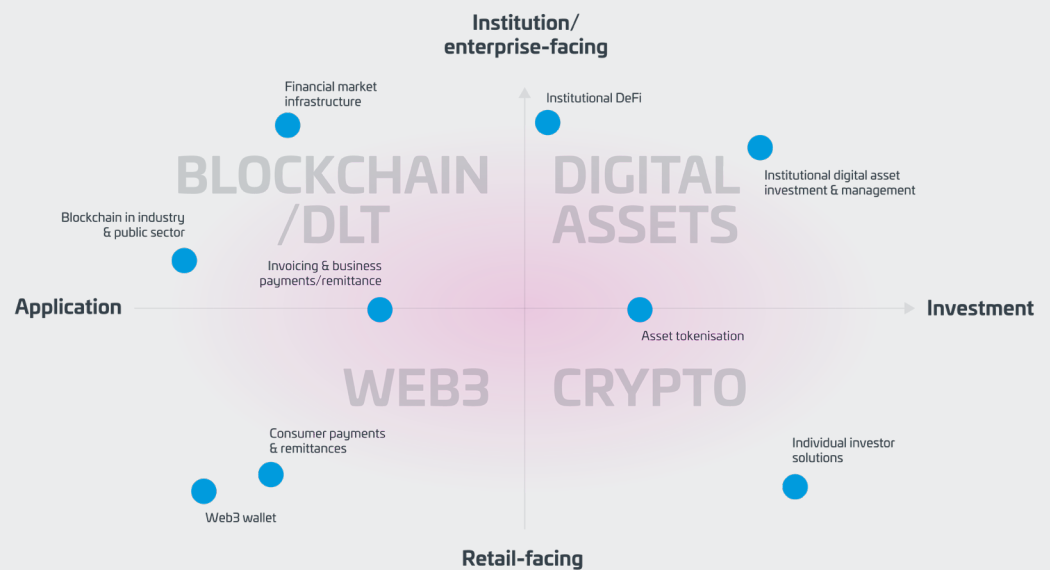
The ecosystem map

All this presents today's enterprise or institutional entity with a great deal more angles than have ever existed before - and all the more need for a unifying prism to make sense of the many concurrent directions in the wider space.

Drawing the threads together, then, we have sketched how what we refer to today collectively as the digital asset ecosystem started in an individual and very narrowly financialised and investment-focused quadrant, and is now expanding extremely rapidly, as it accrues both applications and participants, through institutional/enterprise and more generalised utility-driven channels.

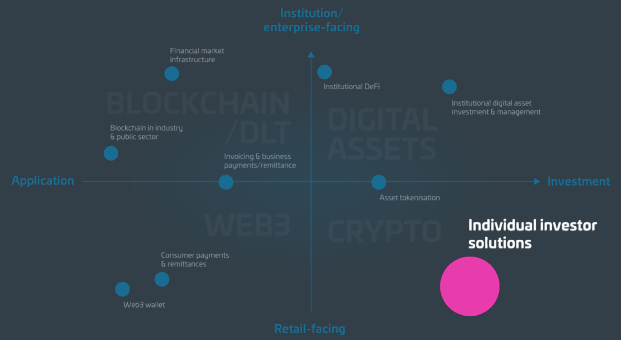
Correspondingly, one way of looking at the digital asset solutions landscape as it exists today is to synthesise that narrative and use the sliding scales of participants and applications to differentiate (a) investment use cases vs broader applications or utilities (b) retail-facing vs more institutionally and enterprise focused offerings. Converting this into chart format, together with some current areas of activity based on the evolutions we have discussed, yields the starting ecosystem map illustrated in the figure below.

Fig. 2:
An ordered segmentation of some of the digital asset opportunities available to enterprise providers today
Note how 'crypto' has expanded to 'blockchain', 'digital assets' and 'web3', with opportunities for enterprise participants in all four quadrants.



Source: Zumo

In the rest of this report, we will use this helicopter view as the launchpad to provide assessments of individual areas of enterprise digital asset activity, defining the particular entry points within the context of the segmentation of the ecosystem we have identified, and the interrelationships and adjoining considerations that may exist among individual use cases. For those interested in exploring the enterprise evolution in further detail, we also offer a closer, data-oriented overview of the developments in use cases and participants, and what that has meant from an enterprise perspective, in the companion guide found at the end of this report.



Chapter 1

Individual investor solutions

At a glance

Blockchain evolution: 1.0
Maturity of application: Established
Enterprise participants: Retail banks; wealth managers; fintechs
Market indicator: ~\$1.02 trillion (total cryptoasset market capitalisation, September 2023)¹⁴

Blockchain 1.0 meets blockchain 4.0

¹⁴ Source: [TradingView](#).

We kick off our consideration of individual areas of the ecosystem with what constitutes the digital asset space’s longest ongoing proposition: the ability to buy, hold and sell different types of cryptoasset, or what we will term individual investor solutions.

Traditionally, individual investor solutions have been the almost exclusive preserve of crypto-native businesses established specifically for the purpose, with the [earliest crypto exchange venues](#) dating their operations back to 2010/11 and only a handful of fintechs diversifying the landscape since.

In 2022, however, with the consecutive collapses of high-profile crypto-first businesses including Voyager, BlockFi, Celsius and FTX due to overall mismanagement, inadequate risk protections and – in certain cases – outright bad faith action, that situation was challenged with a renewed and perhaps final crisis of faith in crypto-native custodian businesses. Finding themselves out of pocket and out of options, the emerging question for retail investors became where (if anywhere) to entrust their cryptoasset funds.

This has presented a unique emerging market opportunity for digital asset investment solutions provided by more traditional incumbent players with financial services pedigree, existing brand recognition and, perhaps, greater levels of consumer trust. As surveys of sentiment have shown, there is real retail interest in such services¹⁵ even if, given the size, requirements and risk tolerance of the institutions involved, it will take some time for the trend to play out in practice and for demand to be fully met.

¹⁵ [Ripple](#), p. 27.



Daniel Ahmed
Co-Founder and COO

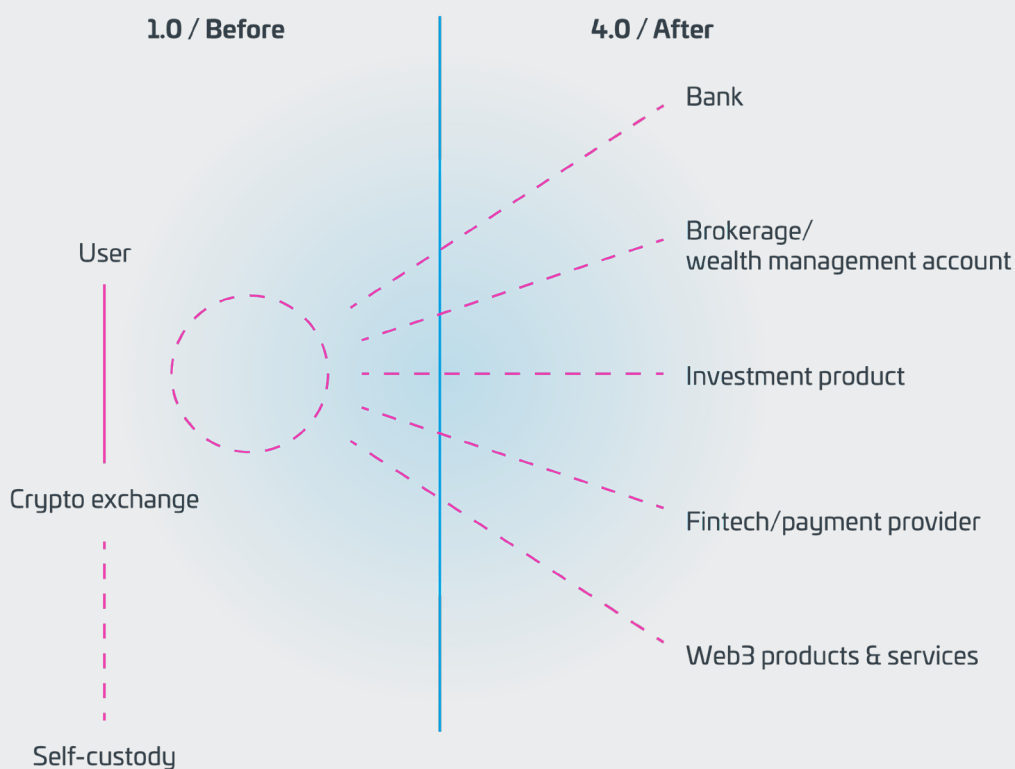


Non-crypto-native businesses, in particular ones with a huge distribution network, present an incredibly quick way for crypto adoption to increase. There is clear interest, and appetite, for more non-crypto-native businesses to offer retail-focused crypto investment solutions.



Most notably, seen in this light, crypto has come full circle with the provision of 1.0 buy/hold/sell services by new 4.0 era enterprise entrants in the form of retail banks; financial institutions; asset and wealth managers; and fintechs. Coupled with developing self-custody/web3 narratives, and the growing availability of crypto-underpinned investment products, this widens significantly the access routes into cryptoasset investment for the average investor.

Fig. 3:
Before and after
Broadening consumer routes into the cryptoasset space.



Source: Zumo

This trend clearly shows through in the evolution in the provision of digital asset investment solutions as we summarise in figure 4.

Leaving aside for a moment all the players we have seen get involved in the digital asset investment space to serve institutional investors and from an institutionally-driven perspective (for which see *Chapter 8: Institutional digital asset investment & management*), the point to emphasise here is the early-stage pivot observable in the nature of enterprise involved in the provision of digital asset investment solutions to retail investors and private clients.

Specifically, we can observe that what we referred to as the pre-blockchain 4.0 eras (roughly speaking, prior to 2022) were limited to early-mover fintechs such as Revolut or PayPal. In contrast, over the past few years – the beginning of the 4.0 enterprise era – this has shifted noticeably towards progressively more established names closer and closer to the rest of the banking and finance world, which in 2023 we can trace from neobank N26 to Dwpbank, which is the securities processor for 1,200 savings and retail banks in Germany, to Fidelity Investments, one of the largest wealth and asset managers in the world, and finally to PostFinance, the retail bank subsidiary of Swiss state-owned Swiss Post. We should expect this trend to continue, at least in jurisdictions where regulatory frameworks continue to evolve in a favourable direction, and to accelerate significantly if and when market conditions improve.

Fig. 4: Crypto Invest
The evolving timeline of enterprise providers providing cryptoasset exposure to retail investors and private clients.



Source: Zumo

IN ACTION
Industry use cases

Project	Description
Deutsche WertpapierService Bank (dwpbank)	Dwpbank’s new platform, wpNex, will provide integrated Bitcoin trading services to all its affiliates’ retail bank customers. Dwpbank offers securities processing to around 1,200 banks in Germany, and crypto holdings will be integrated alongside customers’ existing online banking securities accounts.

Opportunities

Thanks to the growing range of turnkey ‘as-a-service’ infrastructure solutions available to enterprise providers to offer their own digital asset individual investor solutions, enterprises wishing to engage with this area of the ecosystem have the chance to test demand while minimising upfront costs and friction.

IN ACTION

Industry use cases

Project	Description
Fidelity Digital Assets	Launched in 2023, Fidelity Crypto is a US-focused product that allows retail investors to invest in bitcoin and ether in the same account they use to trade stocks, drawing on Fidelity’s trusted brand name and an emphasis on customer education.

Key motivations may revolve around:

- Customer retention and loyalty, and the ability to directly serve areas of investor demand in lieu of deposit outflows to crypto exchanges
- An additional revenue stream from providing cryptoasset exchange services, which has formed an important component of certain fintech business models
- Future-proofing and the provision of timely and relevant added value services and experiences to the [younger customer bases](#) driving digital asset trends.

Considerations

Equally, there are a number of known factors that any enterprise must consider before it can advance with a digital asset investment solution. These may commonly include:

- Regulation, and the need to identify a compliant route to market (and secure, trusted method of ongoing service provision) in advance of the release of any product offering
- Education and duty of care obligations, both as a service provider, ensuring that potential product offerings are carefully vetted and managed, and in terms of providing consumers with the proper level of information to make informed decisions
- Sustainability, and the consideration (and response) to environmental impacts arising out of offering specific cryptoassets.

Ecosystem interactions: the twin paths of custody & self-custody

Finally, at the ecosystem map level, it is worth noting the evident mirror counterpart to the individual investor solutions use case that can be found in the institutional quadrant and the provision of digital asset management and investment services to institutional entities, whether these be corporates, family offices, hedge funds, asset managers, or market makers (*Chapter 8: Institutional digital asset investment & management*).

While specific requirements in this quadrant will inevitably vary quite considerably from the needs of individual retail investors, the core service is at its heart the same: the custody, management and trading of digital assets. Correspondingly, there is some significant overlap and bundling in the way this is referenced in public discussion of digital asset ‘enterprise’ adoption and the enabling infrastructure that has emerged around it, which may be directed more to retail or institutional contexts, or both.

Second, and perhaps more notable, is the close interaction of individual investor solutions and the adjoining ‘web3’ quadrant of more applied individually-targeted solutions. Here we enter the realm of custody vs self-custody. Digital assets are notable for being bearer assets – the fact that owners may take their pick of self-custodying their digital assets (in what is often referred to as a self-custody, or non-custodial wallet) as well as the option of custodying them with a trusted provider.

To return to the thread of FTX, we observe here a further interesting trend. As well as the distrust that emerged around crypto-native custodian platforms at this time – to the potential benefit of enterprise – it would be remiss to overlook the corollary track that turned in the opposite direction, and users’ growing preference to remove assets from custodianship entirely to be held in their personally controlled digital asset wallets.¹⁶

¹⁶ As illustrated, for instance, by the [flow of coins off exchanges](#) over 2022 and 2023.

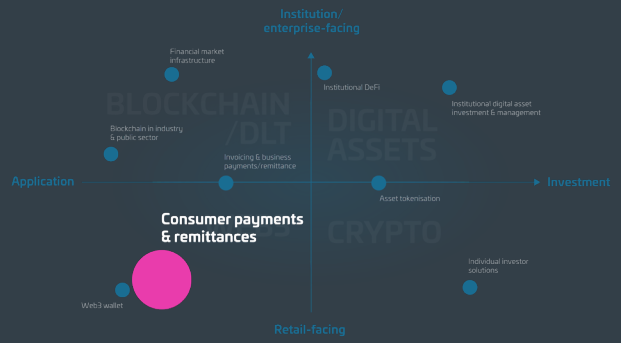
This is particularly relevant in the web3 context (picked up in more detail in *Chapter 3: Web3 and the web3 wallet*) given that self-custody wallets are web3’s key piece of enabling infrastructure. If web3 visions of individual-to-individual payments, portable self-managed identity, and self-owned assets are to be realised, it will be from the starting point of a web3 self-custody wallet.

Therefore, enterprise providers should be mindful of infrastructure choices they make even at the stage of first offering individual investor solutions. If content to opt for a closed loop custodial system, they should at the least be aware of the adjoining and in that case competing self-custody driven strand that is web3; in turn, if they wish to expand over time into use cases beyond pure custody-based trading and investment, they should consider whether it makes sense to offer self-custody options to customers from an earlier stage. These are nuances that should be discussed with the infrastructure provider, which may vary in flexibility regarding the combination of custody and self-custody solutions. A holistic consideration is always worthwhile.

IN ACTION

Industry use cases

Project	Description
Robinhood	The Robinhood Wallet is a non-custodial, or self-custody, wallet that allows Robinhood customers to safeguard digital assets, trade and transfer crypto, and secure and manage NFT collections. Described as a portal to web3, in April 2023 the wallet was supplemented with the announcement of Robinhood Connect, a way for customers to fund their web3 wallets directly from within decentralised applications.



Chapter 2

Consumer payments and remittances

At a glance

- Blockchain evolution:** 1.0
- Maturity of application:** Established
- Enterprise participants:** Fintechs; payments processors; remittance providers; banks; central banks
- Market indicator:** ~\$11.1 trillion (stablecoin transaction volume 2022)¹⁷

Unlocking value with blockchain-based payments

¹⁷ Source: [Brevin Howard](#), p.20

Together with investment, payments – the ability to freely send and receive different types of digital assets between individuals worldwide – represents the other most established use case for digital assets.

Especially across borders, payments (and particularly consumer payments and remittances) are a well known source of cost and friction. In an average year, US consumers alone are [estimated to pay over \\$16.3 billion in foreign exchange fees](#) (hidden exchange margin and overseas charges). Clearing and settlement time for cross-border bank payments is [measured in days](#), and in 2022, remittance costs were still eating up [6% of the average remittance payment](#).

IN ACTION

Industry use cases

Project

Description






Stellar x MoneyGram

In partnership with MoneyGram, Stellar’s open-source platform for currency payments enables any user to convert physical cash into digital dollars and back without needing a bank account. USDC stablecoin on the Stellar network has processed over 3 billion in payments volume.

The addressable market for such applications in the consumer context is clearly non-trivial, with **EY estimating** US\$2.8 trillion for consumer-to-business (C2B) transactions such as cross-border e-commerce and offline tourism spend; US\$1.6 trillion for business-to-consumer (B2C) transactions such as cross-border salary payments (remote work); and US\$0.8 trillion for consumer-to-consumer (C2C) remittances.

Even in the most sceptical of quarters, there is therefore a recognition of the value of blockchain-based payment assets in speed of settlement; the 24/7, borderless and disintermediated nature of blockchain-based payments; as well as the **potential programmability features** such payment methods may enable.

Fig. 5: Blockchain payments
Settlement speeds and transaction fees for payments on selected blockchains as at August 2023.

Blockchain	Stablecoin circulating supply (USDC, millions)	Settlement speed	Transaction fee
 Ethereum	\$24,020M	~180s	\$0.67
 Solana	\$656M	~0.5s	< \$0.01
 Polygon	\$603M	~3s	< \$0.01
 Avalanche	\$394M	~1s	< \$0.01
 Arbitrum	\$199M	~3s	< \$0.01

Source: **Circle** (circulating supply and fees updated for August 2023)

Though a staple of the landscape ever since the 1.0 days of peer-to-peer payments via cryptocurrencies such as Bitcoin, the digital asset payments ecosystem and associated payments narrative has enjoyed somewhat of a rejuvenation in the 4.0 era with the addition of new (potential) varieties of digital payment assets beyond unbacked cryptoassets. These include the increasingly popular stablecoin (a blockchain-issued token pegged to a specific reference asset, commonly the US dollar, and backed by reserves held in the reference asset by the stablecoin issuer); deposit tokens (a blockchain-issued equivalent of commercial bank deposits); and central bank digital currencies, or CBDCs, which are state-issued equivalents of the e-cash concept, effectively a digital form of a country’s official currency issued and regulated by the central bank.

CASE STUDY



Emma Kerr
Senior Vice President & Head of Strategic Partnerships Europe, Visa, said:

Visa, a leader in global payments, is a well-known player that has been active in exploring emerging digital asset opportunities in the payments space, having formed its crypto team in 2018. Among its initiatives, Visa has continued to work on updates to its settlement platform to enable settlement payments in USDC, most recently announcing the expansion of these stablecoin settlement capabilities to participating merchant acquirers.

“Crypto and digital currencies have the potential to shape the future of payments, and it’s as important as ever to understand what our clients and partners need in order to leverage new technologies to help improve the way money moves and financial services are delivered. Visa’s work in crypto started tangentially to our core business, and we advise the same to our clients. To begin by learning, building a team internally, and then moving closer to the core. It is still early, but we see huge potential in blockchain and other new technologies to facilitate faster and more efficient money movement for the benefit of Visa’s clients and end consumers.”

While cryptoassets and stablecoins in particular clearly have the headstart in terms of current adoption, the digital asset payments space continues to hot up with the exploration of the direct challengers of deposit tokens and CBDCs, and this will be an evolution enterprise providers will need to follow carefully as they consider the nature of their digital asset payments provisions.



Jannah Patchay
 Director;
 Executive Director / Policy Lead

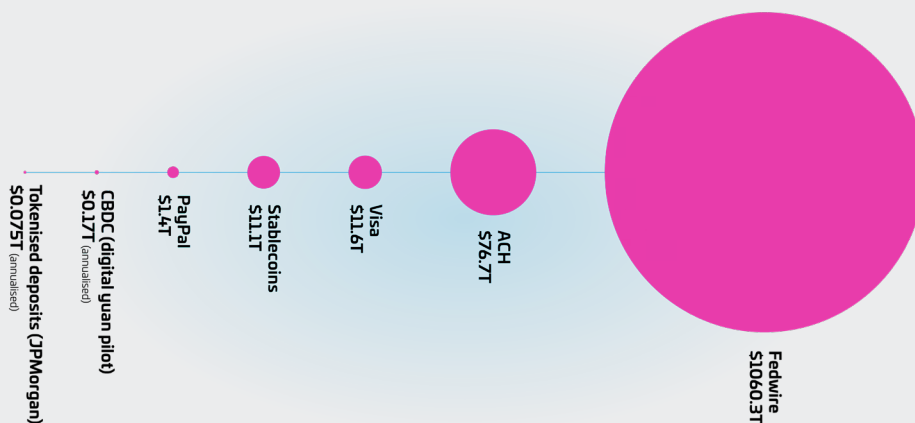


We're likely to see a future in which multiple different forms of money – both public and private, and both those currently in use as well as new forms of digital money – coexist. Each has the potential to fill a different niche in the ecosystem and to provide enhanced consumer and business choices, arising from their different characteristics, the technical functionality that they offer, the nature of their issuers and their risk profiles (both real and perceived). For a truly diverse, competitive and effective ecosystem for new forms of digital money to become a reality, seamless interoperability, convertibility, and – above all else – preservation of the singleness of a given fiat currency in all its varied formats, will be required. Just as bank deposits can today be converted into cash, or e-money into bank deposits, the future evolution of money and payments will require equally seamless, trusted and invisible conversion between cash, bank deposits, e-money and new forms of public and private digital money.

Fig. 6:
Future of money
 Current adoption of emerging stablecoin, deposit token and CBDC digital payments assets (transaction volume, 2022) in the context of established payments infrastructure.

Data: [Brevan Howard, JPMorgan, Bank of China](#)¹⁸

¹⁸ Note: given the very limited number of currently active CBDC/bank deposit token initiatives, these categories have had to be proxied on the basis of representative examples where public data and statements are available. Readers should note that CBDC/tokenised deposit transaction volume figures have been annualised for purposes of comparison, and also that stablecoins fulfill a variety of functions (such as liquidity for cryptoasset trading pairs) beyond pure payments. Accordingly, the comparison should be used for broad context only.



Opportunities

In the most immediate term, the opportunity for consumer-facing providers such as fintechs, consumer payments processors and remittance providers likely lies in harnessing the existing product-market fit of cryptocurrencies and stablecoins to offer value added services to their customers.

IN ACTION

Industry use cases

Project

Description

PayPal

In August 2023, PayPal launched its US-denominated stablecoin, PYUSD, which opens up the possibility of stablecoin payments direct via the PayPal checkout for PayPal’s 400+ million customers.

These may commonly include:

- Send functionality enabling end customers to easily send different types of digital asset among their network and contacts
- Tapping into specific blockchain-facilitated consumer payments use cases such as remittance; crypto-linked debit and spending cards; or functionality to receive and request salary or other beneficial payments
- Enabling merchant and business clients to accept cryptocurrency or stablecoin payments from their end customers at attractive speed and cost.

IN ACTION

Industry use cases

Project

Description

Shopify

Shopify maintains a suite of blockchain commerce tools for merchants which, in addition to long-standing support for cryptocurrency payments, has recently been extended to include NFT distribution and tokengating/loyalty programs.

Considerations

At the same time, such solutions will require a careful consideration of some of the key design choices and operational factors. This might involve:

- The choice of blockchain(s), which may differ significantly in architecture, settlement speed and user transaction costs (see also fig. 5)
- The choice of payment asset type, whether stablecoin, cryptocurrency or other, together with a consideration of interoperability and exchange functionality with other payments instruments such as e-money and the commercial banking system
- Solutions compliance with payments-related regulation, including payments cryptoassets that may come within the regulatory perimeter and operational obligations such as the [travel rule](#) for tracking originator and beneficiary information.

Ecosystem interactions: towards a new payments ecosystem?

In the same way that, in the case of digital asset investment, we observed distinctions and interactions between custody and self-custody models, so too with payments there are distinctions and interactions to be identified between what we might term ‘challenger’ forms of digital money and the emerging alternative forms of digital money that come from within the established system. As we already began to touch upon, ‘challengers’ are primarily cryptoassets and stablecoins while the emerging ‘responders’ are represented by commercial bank deposit tokens and CBDCs.

For example: in principle, commercial bank deposit tokens can fulfil a similar practical value transfer and settlement function to stablecoins, as could a payment cryptoasset vs a CBDC. The underlying guarantees and individual preferences are where the difference is found. In the case of deposit tokens vs a stablecoin: would the user rather have a claim on a commercial bank, or on a challenger, non-bank stablecoin issuer? For cryptoassets vs CBDCs, does the user value more the neutrality and user determination of a decentralised money network, or would they rather trust the guarantees of a state-backed digital currency?

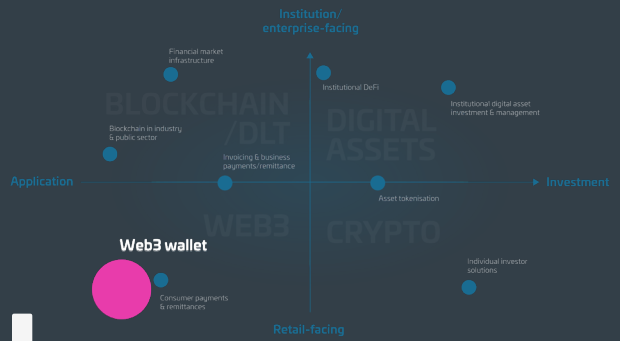
This extends to the types of functionality that a solution wishes to unlock. Stablecoins have a different underlying claim than a deposit token. But they also open access to specific functionality, such as participation in decentralised finance (DeFi) applications, or trading and exchangeability with other types of cryptoasset. The same goes the other way round: a cryptoasset could be used in an enterprise payments context, but likely needs converting back into fiat currency to pay for goods and services where a hypothetical CBDC would not.

Therefore, it is critical that enterprise providers should understand the architectural decisions and design intents behind different digital asset payments solutions and how these may appeal to different segments of end customers as well as different implementation contexts.

As the digital asset payments space evolves, the pertinent question will be to trace how the broader payments ecosystem comes to be structured over time and how different forms of digital money might coexist in that ecosystem according to the varying needs and use cases of the individuals and entities that participate in it. This likely has room for concurrent and quite different visions of the way in which payments services are provided over time within the substantial terrain of the digital asset ecosystem.

At the highest level, it seems difficult to imagine that emerging proposed solutions such as tokenised bank deposits or CBDCs would have come into existence in the first place without the catalysing effect of the explosion of popularity in cryptoassets and stablecoins.¹⁹ Therefore, even those who have no interest in ‘crypto’ or ‘TradFi’ in isolation should realise the extent to which these respective environments play off one another (see also *Chapter 9: ‘Institutional DeFi’*). For the enterprise provider, the trick is to know one’s needs and strategic objectives, and have the holistic overview of both.

¹⁹ Credit to [Dr Apostolos Kourtis](#) for first introducing this idea.



Chapter 3

Web3 and the web3 wallet

At a glance

- Blockchain evolution:** 3.0
- Maturity of application:** Early
- Enterprise participants:** Brands & entertainment; merchants & retail commerce; venture capital; fintech; banks
- Market indicator:** ~\$94 billion (capital invested in web3-related companies globally)²⁰

Web3 - the new digital economy?

²⁰ Source: [Bain & Company](#).

At this point in the discussion, we move beyond the comparatively established use cases of investment and payments to the decidedly exploratory consideration of the more general-purpose utility we characterised as some of the emerging application of digital assets and blockchain technology – or, to use the consumer-facing umbrella term: web3.

Web3’s point of departure, at least at the individual user level, is that the internet as we know it today comes with its [user-side imperfections](#). Data breaches have become commonplace; personal data has been monetised to the advantage of others; and in general value has accrued to the handful of large technology providers who operate the proprietary walled gardens that control, facilitate and, potentially, restrict the online applications users interact with on a daily basis.



Sean Kiernan
CEO
Greengage

Web3 represents a transformative shift in financial services. This transition requires robust technical expertise, strategic partnerships, and a commitment to staying at the forefront of innovation in the decentralised financial space. By doing so, we can harness the potential of web3, creating a more equitable and interconnected digital economy.

Therefore, the [core proposition of web3](#) is that it can use the decentralised technologies of digital assets and blockchain as a base to deliver a reimagined single and open internet of value that allows for the unrestricted flow of value across all users and entities, and returns sovereignty and determination to the individual user through a range of applications encompassing not only self-custody of digital assets but also self-managed identity and personal data, and decentralisation of key infrastructure services.

IN ACTION

Industry use cases

Project	Description
ENS	The Ethereum Name Service (ENS) is a decentralised domain naming system built on the Ethereum blockchain that can be integrated to create decentralised websites and single, user-managed logins across platforms.

Does this mean, then, that traditional ‘enterprise’ is cut out entirely?

On the contrary, those who have monitored the emerging non-primarily-financialised use cases arising out from under the wider web3 banner, including blockchain in gaming, or NFT brand engagement and loyalty schemes through recognised ‘web2’ brands, believe that blockchain technology, where it can be applied to consumers’ everyday lives online – even if that comes from established non-web3-native businesses – could represent the breakout point for mass adoption.

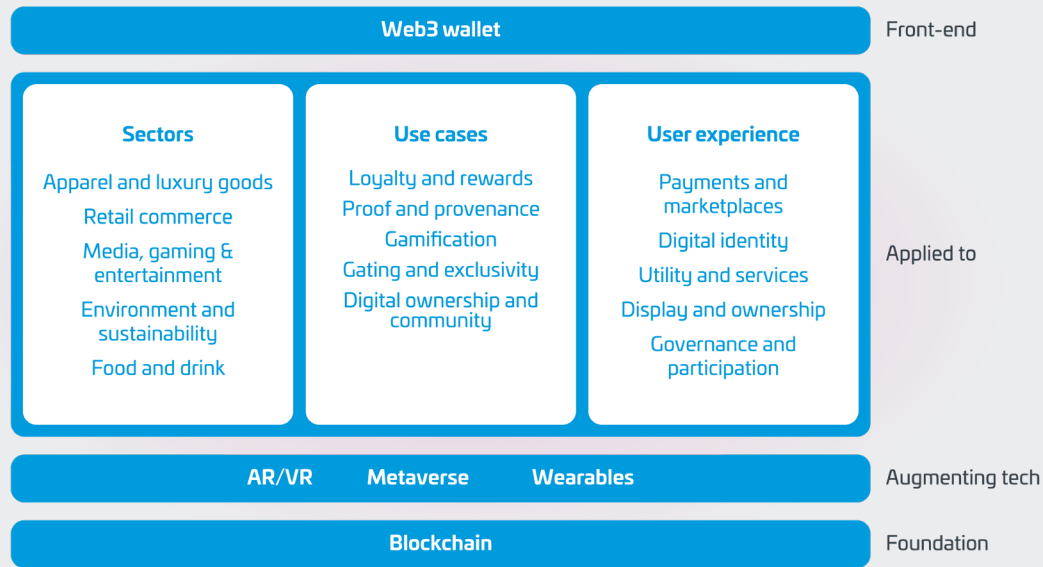


Paula Kilgarriff
Web3 Brand Activation
Consultant & Retail
Innovation Lecturer

In retail, we would say Web3 is all about hyper-personalisation, co-creation and evolution. For example, I would log into the website, connect my wallet, and then the whole shopping experience would be hyper-personalised in real time. I then own my assets, and get incentivised for my data. It’s really about how brands are developing new communities and new protocols.

In this view, blockchain technology, proponents argue, is likely to [mimic the wave pattern](#) observed in the adoption of the internet, with the first wave reserved for native ‘dot coms’ and the second wave of mass permeation achieved through implementation from everyday businesses. And, as [observers have suggested](#), much of the technological plumbing will over time be invisible to the end user and driven by the merchants and retail-facing businesses that want a larger role in the new digital economy.

Fig. 7: Web3 for brands
How everyday business incorporates web3-derived functionality.



Source: Zumo

Even further out, the collection of blockchain-powered experiences, when matured within potentially AR or VR enhanced online environments, speaks to the concept of an [‘open metaverse’](#), or a completely functional online immersive world that runs on the ‘operating system’ of decentralised blockchain technologies.



Mark Williamson
Managing Director



“ We’re seeing these different versions of the metaverse evolving: industrial, supply chain and consumer. And so tying those three different aspects together, looking at a luxury handbag, for example. You can see that, in the factory, the materials have been sustainably sourced and how the product is being made. Then it goes into the supply chain metaverse: it’s being tracked and again you have embedded systems for FX, payments, financing and decarbonising the supply chain. And finally for the consumer, you can see from your wearable device that the product has come in stock, and there’ll be a digital wallet, ID system and connectivity into blockchain ecosystems to make your payment. And you’ll be able to get the NFT that proves you bought an authentic luxury handbag. So we’re seeing those sorts of examples coming through as real world use cases. ”

The question from the enterprise perspective becomes: how to monitor and adapt to such new models of online commerce and customer interaction, as and when they emerge, in a way that remains relevant and continues to encourage engagement with the customer base.

Opportunities

While applications remain extremely early, a variety of enterprise participants have been able to tap into web3 to support and experiment with a new generation of digital experiences and customer engagement.

IN ACTION

Industry use cases

Project

Description

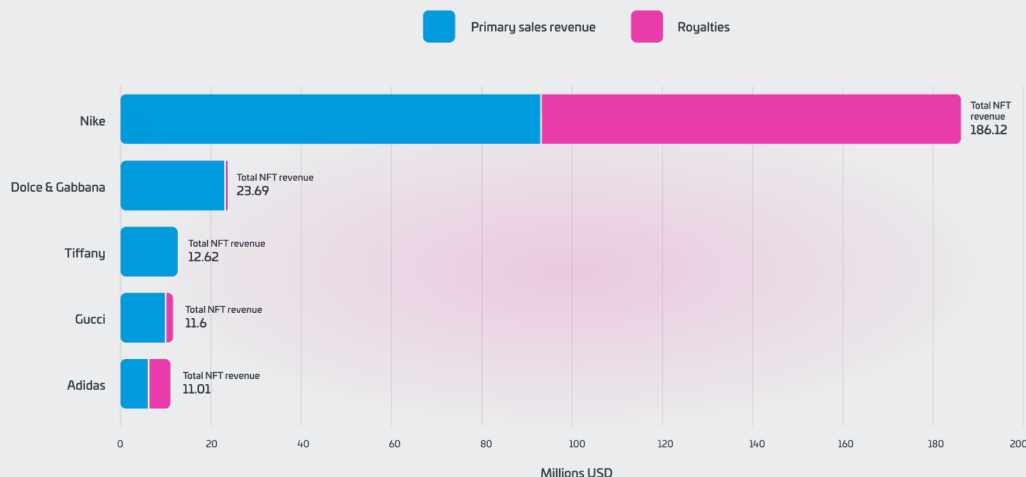
Starbucks

Starbucks Odyssey is an extension of the Starbucks rewards scheme that allows customers to earn and purchase NFTs unlocking exclusive rewards. In 2023, its 2000 'Journey Stamps' NFTs sold out in 20 minutes.

These opportunities include:

- For consumer, luxury and entertainment brands, the chance to incorporate web3 functionality – to date primarily NFT offerings – with a view to delivering next-generation consumer experiences, perks and community engagement
- For banks and fintech, the possibility to enable innovative customer experiences and gain brand recognition in the web3 context either through [metaverse presences](#) and [direct web3 wallet-enabled services](#), or through the enablement of business clients to offer their own web3-related services
- For venture capital, the ability to invest in the potential infrastructure projects of the next generation of the internet and follow investment theses on what the next everyday consumer application of blockchain technology might be.

Fig. 8:
NFT commerce
Top five brand NFT issuers
by total revenue 2022
(millions, USD).



Data: [Dune Analytics](#)

IN ACTION

Industry use cases

Project	Description
Nike	Branded as the first native web3 sneaker, Cryptokicks iRL is a collection of sneakers sold as digital NFT collectibles with physical counterparts. In 2022, Nike amassed \$185 million through NFT sales.

Considerations

At the same time, experimenting with applications that are both at an early adoption stage and require the addition of new (to many unfamiliar) technology brings its own particular considerations. These may commonly include:

- Careful evaluation in the choice of wallet partner for enabling functionality such as customer self-custody of digital assets such as NFTs, bearing in mind factors such as usability; mobile support; security assurances; and handling of the onboarding experience
- The business case and proof of concept for adding in a web3 strategy to existing operations
- Potential customer concerns around sustainability and the knowledge that must be communicated to take advantage of new-format solutions, as well as any relevant regulatory and compliance restrictions.

Ecosystem interactions: the beginning of the road

It is worth noting, all of the exploratory applications we might discuss in the web3 context rely on and are facilitated by the self-custody wallet – which, as the reader may recall, is one of the design choices we discussed as a crucial interaction in the digital asset investment context. While, looking at it from the web3 angle, we might not yet know what the true mass-scale decentralised applications, or ‘dapps’, of the future might be, what we do know is that it all begins with the foundational infrastructure of a secure, usable self-custody wallet. Web3 should therefore be viewed as an extension of – and complement to – the more established investment and payments use cases we have discussed in preceding chapters, and longer-term roadmaps designed accordingly.

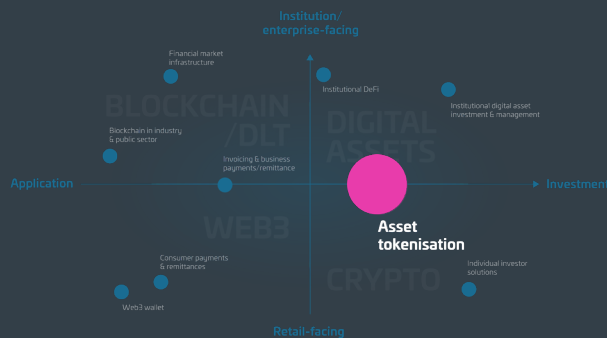
Further, when we look in closer detail at the sorts of decentralised applications emerging out of the [web3 toolbox](#) – particularly decentralised finance (DeFi), governance and identity – it becomes clear that individual web3 applications may equally have their enterprise mirror. To cite just a few examples, common DeFi applications such as borrow, lend and digital asset staking services may equally well be harnessed by entities as well as individuals (see *Chapter 9: 'Institutional DeFi'*); and in the same vein, an institutional holder of digital assets may participate in on-chain voting and governance just as would an individual holder of a governance token. Alternatively, individual solutions may be adapted for or actively support enterprise use cases: for instance, the web3 building block of decentralised identity credentials used to [enable blockchain-based KYC](#) for enterprise providers. As individual investor solutions have their institutional investor equivalent; as challenger payments have their established financial services counterpart; so too do web3 applications as imagined for the individual user have their use cases that can be transposed to an institutional and enterprise context. As with almost all areas of the ecosystem, the cross-pollination in ideas and concepts is high, meaning a need and advantage from looking beyond the confines of one's most immediate area of interest.

Finally, to close off the point we made about waves of adoption, we might also expect the direction of this evolution to have its distinct consumer and business-facing components. Considering that the wider arc we discussed was one of a technology-native wave followed by one of everyday commercial adoption across the population and across sectors of the economy, we could interpret this in two senses. The first consumer and retail-facing element, which we summarise as web3, we have already discussed; but equally, there is a second more business-facing and own-operations element to this trend, which is the applied enterprise mirror of what we could call blockchain in industry. In this sense, enterprise blockchain – the use of blockchain-derived applications by businesses in their own business for an applied purpose – is simply the corporate-facing analogue of web3, and this is a strand of activity we explore further in the dedicated 'Blockchain in industry & public sector' chapter (*Chapter 6*).



Chapter 4

Asset tokenisation



At a glance

- Blockchain evolution:** 2.0
- Maturity of application:** Developing
- Enterprise participants:** Asset and fund managers, issuers, trading platforms, custodians
- Market indicator:** 91% (percentage of institutional investors expressing interest in investing in tokenised products)²¹

Tokenisation is eating the world?

²¹ Source: [BNY Mellon](#), p.9.

Continuing the emerging use case theme, asset tokenisation – the idea of representing an asset as a digital token that lives and is managed on the blockchain – has quickly become one of the industry’s hot topics.

IN ACTION Industry use cases

Project	Description
HSBC	HSBC Orion is a proprietary tokenisation platform launched by HSBC to allow financial institutions and corporates to issue digital bonds based on distributed ledger technology.

Technically, tokenisation is a product of the blockchain 2.0 evolution, and the advances in programmability that first facilitated issuance of tokens on blockchain networks. This is what added the concept of crypto ‘tokens’ – secondary programmable assets sitting on top of blockchain networks – to crypto ‘currencies’ – the single native blockchain asset of a particular blockchain network that is core to the functioning of the network itself.²² Today, of the tens of thousands of cryptoassets in existence, the vast majority are precisely such crypto tokens, and may represent all sorts of claims, ranging from a digital dollar (the ‘stablecoin’ token); a particular piece of digital property (the ‘non-fungible token’ or NFT); or access to a particular virtual good or service (the ‘utility token’).

²² A good introductory explainer of the important differences between cryptocurrencies and crypto tokens may be found [here](#).

Tokenisation has been a transformative development in the blockchain sector for two principle reasons. First: the realisation that tokens can be programmed to be either fungible (i.e. freely interchangeable, like the £5 note in your wallet) or non-fungible (i.e. non like-for-like interchangeable, like your house or a particular plot of land). And second: the realisation that tokens could be issued not only to be blockchain-native (sometimes also called unbacked, meaning that the asset is native to the blockchain and is not linked with anything outside of it) but also asset-referenced (sometimes also referred to as [real world asset tokenisation](#) and meaning a link, peg or ‘digital twinning’ to some asset existing outside of the blockchain, whether a dollar in a bank account, a piece of real estate, a physical item, or a business asset). Taken combined, this flexibility opened up blockchain to housing tokenised representations of nearly any type of conceivable item or asset, as representatively outlined in the figure below.

Fig. 9: The tokenised world

A selective categorisation of potential tokenisation vehicles across the digital and real-world economy.

²³ Observant readers will note that tokenised financial assets appear in both the ‘blockchain-native’ and ‘asset-referenced’ category. This is because of the different mechanisms that may be employed in tokenisation. In the ‘blockchain-native’ case, a newly issued security is tokenised natively on the blockchain directly by the issuer (for example, this [Siemens bond issuance](#)). It exists and is administered exclusively on the blockchain. This contrasts against the ‘asset-referenced’ approach, where a security already exists in conventional format, and the tokenisation provides a ‘digital twin’ that is a fully-backed blockchain representation (similar in principle to the stablecoin) of the real-world asset held off the blockchain by a conventional custodian (for example, this [share issuance by RKH](#)).

²⁴ See previous note.

Source: Zumo

	Fungible	Non-fungible
Blockchain-native	Cryptocurrencies and tokens Security tokens & tokenised financial assets (tokenised equities, bonds, funds) ²³	NFTs of in-game items, digital collectibles and virtual goods NFTs of blockchain identity credentials
Asset-referenced	Stablecoins ‘Digital twin’ tokenised financial assets ²⁴ Tokenised derivatives (‘synths’) Tokenised commodities and other assets (e.g. carbon credits)	NFTs representing real-world items (goods, real estate, physical artwork) NFTs representing intellectual and intangible assets (IP, music, certificates of attainment)

Understanding this, we realise that almost anything in existence can (different from should/regulatorily possible) be tokenised on a blockchain to realise blockchain-unique efficiencies such as speed of settlement, 24/7 uptime, global penetration, and disintermediation – and there are those who would argue that, given sufficient time, everything will be. Given that immense scope, the question becomes: where should the immediate focus be; or in other words, tokenise what?

IN ACTION

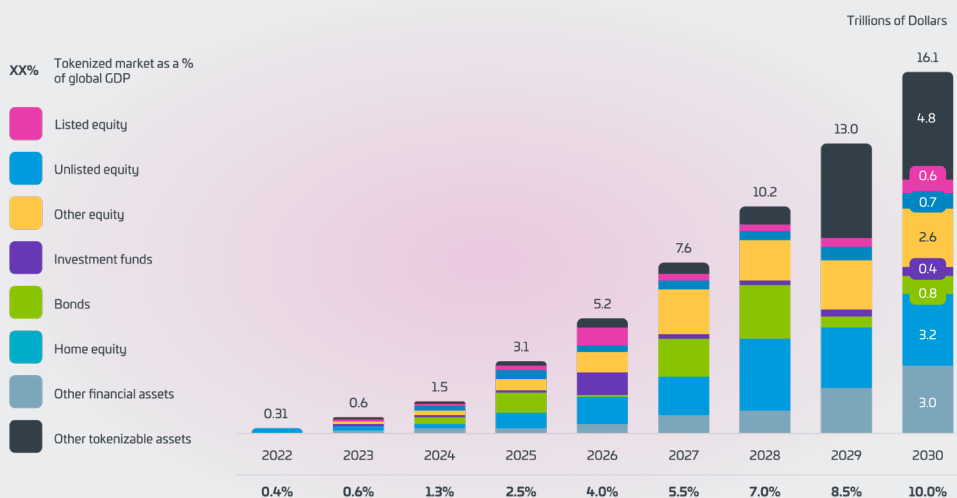
Industry use cases

Project	Description
Paxos	Pax Gold is a digital token backed by physical gold that offers investors a cost-effective and blockchain-enabled way to gain exposure to the gold commodity. Each Pax Gold (PAXG) token is backed by one fine troy ounce of gold, stored in LBMA vaults in London.

Within the enterprise context, and the financial services community in particular, the clear answer has lain in the potential application of tokenisation to financial assets, the financial markets and the entire operation of asset management. Faced with fragmented global markets, complex custody and intermediary chains, and illiquidity in certain asset classes, blockchain is seen as an opportunity to democratise investor access across borders; improve the transparency and integrity of data; and increase liquidity with initial areas of focus in private equity/debt; fund products; and listed equities.²⁵ The appetite for the trend is not to be underestimated, with Blackrock CEO Larry Fink recently referring to tokenisation as ‘the next generation for markets’ and forward estimates forecasting the size of the tokenised market at as much as 10% of global GDP by 2030.

²⁵ BNY Mellon, pp. 26-27.

Fig. 10: Towards a tokenised market
An assessment of the tokenised market to 2030 by asset class.



Source: BCG

As we can see from the graphic above, the predicted evolution over time towards other financial assets aside from the big buckets of equity, bonds and home equity, as well as the new category of ‘other tokenisable assets’, which could be anything imaginable, from a sustainable infrastructure project to a small business’s invoice receivables, belies tokenisation’s posited ‘killer app’: which is not only the injection of new, diversified liquidity and efficiency to already liquid markets, but also the provision of liquidity to previously entirely illiquid assets. Taken to the extreme, this is the hyper-financialised view – seen also in aspects of web3 development – where everything in existence, from the [steps you take](#) to every physical and virtual item you own, even [your own self](#) – becomes a tradable and marketable good.



Jannah Patchay
Director;
Executive Director / Policy Lead



Looking beyond existing asset classes, things become a lot more interesting. Illiquid assets today tend to be illiquid due to their complex legal documentation, the high degree of due diligence involved, and the challenges of valuation. They can also reference a number of underlying assets, all of which must be included in any transfer of ownership, and all of which require valuation and risk assessment as well, culminating in significant, onerous paperwork to effect a transfer of ownership. Tokenisation of these illiquid assets can lead to a host of benefits.

Accordingly, the reach of the tokenisation trend straddles the retail and institutional divide, offering individual investors new investment opportunities and ability to participate in value capture while also offering asset managers, businesses and the whole finance value chain new and innovative ways to approach capital raising and investment products.

In short, it is a trend that, pursued to its fullest extent, extends over everything financial and every type of asset. With the support of some of the biggest asset managers worldwide, and sandbox regulatory environments being developed in multiple jurisdictions,²⁶ this is a long-discussed use case whose time may have come.

²⁶ Notable examples of which include the EU DLT pilot regime for market infrastructures, and the UK's proposed Digital Securities Sandbox.



Christopher Agathangelou
Head of Digital Capital Markets
and Flow Credit



* The tokenisation of assets, involving the digital representation of traditional assets on distributed ledgers or the issuance of traditional asset classes in tokenised form (OECD, 2020)



At NatWest, we see great potential in tokenisation of traditional assets* and adoption of enhanced market infrastructure to serve our customers better. We are investing in building digital issuance capability to support our Commercial and Institutional customers, engaging in open conversations to educate, and encourage challenge from, our customers, as well as peers.

It is truly exciting to see the material uptick in activity in the market for digital bonds over the past year, but also mindful of the fact that the existing market could be perceived as fragmented and implementation designs are being developed in silos. Wider industry collaboration will be crucial to address the longer-term challenge around interoperability to establish some form of “common ground”, establish stepping stones towards transacting with others and unlocking liquidity.

Establishing a viable use case with ability to deliver real value-add and address friction is key. Our focus is driven by the evolving needs of our customers and beyond digital bonds we consider tokenised deposits, digital repo and digital green bonds to be prominent use cases worthy of exploration to improve conventional capability.



Opportunities

Looking at it through an enterprise lens, opportunities in the asset tokenisation space are as wide-ranging as the technology itself, and may commonly include:

- For asset managers, the opportunity to realise settlement efficiencies, deepen liquidity and broaden offerings into new (previously illiquid) asset classes of all types, democratising investment by reaching new investor bases
- For businesses, entrepreneurs and asset issuers, the potential to harness tokenisation models to secure access to financing and create new tokenised markets to support enterprise and commerce
- For trading venues, the opportunity to build out integrated access to the full spectrum of digital assets, both cryptoassets as well as tokenised securities and other real-world assets.

Considerations

From a practical perspective, as in other areas such as payments, what is technologically possible must be reconciled with the operational framework as it exists today and as it is developed to accommodate new means of value transfer.



Tom Zschach
Chief Innovation Officer



“Tokenisation has been identified by the capital markets industry as having the potential to increase efficiency, reduce costs, and open up investment markets to more people by enabling fractional ownership. But, with different blockchains – all requiring different functionality and having different liquidity profiles – there’s a clear need for interoperability to give financial institutions one single point of connectivity.”

Common challenges at this early stage of development may include:

- Where a token is a derivative or ‘digital twin’ of an existing real-world, that is to say non-blockchain-native asset, the legal and regulatory complexities in determining the legal rights of token holders, tokens’ regulatory status in different jurisdictions, and the processes by which underlying assets, be it a property deed or a carbon credit in a registry, are custodied and managed
- Not without its irony, the transitional market fragmentation that may arise out of tokenisation if, for instance, we see parallel competing markets for tokenised vs conventionally issued securities; silos between proprietary tokenisation platforms; existing real-world assets bought up from conventional marketplaces to **issue tokenised derivatives**; and/or the lack of common regulatory interpretations or provisions for tokenised instruments to be made available across jurisdictions and investor classes
- The adoption hurdles inherent in persuading the critical mass of investors and market participants to switch over to new tokenised versions of existing asset types. As with other blockchain technologies, doing this successfully relies on cumulative network effects, which are hardest to generate at the beginning of the journey when users are few, solutions are at their most untested, and practical operational questions at their most unclear. The flipside is that such solutions move first slowly and then very quickly as the hurdles are cleared and initial momentum is achieved, and it seems at this kind of point that we find ourselves with asset tokenisation today.

Ecosystem interactions: the token economy

²⁷ Subject to design choices such as the blockchain implementation selected for tokenisation.

As a core building block of the blockchain-enabled world, tokenisation is a sprawling topic that touches on and interacts with almost every aspect of the digital asset and enterprise ecosystem – and several of the other chapters we treat in this report. Once tokenised,²⁷ an asset becomes deployable in a variety of decentralised finance applications, from simple token swaps in decentralised exchange venues to more complex operations such as the obtaining of loan financing against tokenised invoice collateral. Thus, tokenisation provides the base for intriguing new enterprise use cases at the business level (*Chapter 9: ‘Institutional DeFi’*). Along a similar line, it is tokenisation that lies at the heart of many of the banking and finance related developments in the blockchain space, from securities settlement to digital asset custody and debt financing via bond issuance, as should already be clear in our framing of tokenisation as applied to financial assets, and which we will explore more concretely in the dedicated Financial Market Infrastructure chapter (*Chapter 7*). And finally, for public players and enterprise participants outside of financial services, too, there are real-world tokenisation use cases, all the way from tracing supply chain goods to identity credentials to tokenised energy attribute certificates trading, that expand the horizon of what can be achieved using blockchain technology. This too we cover in our chapter on Blockchain in Industry & Public Sector (*Chapter 6*).

In the broadest sense, the interaction – similarly to what we see in the digital asset investment and payments space – is one of progressing overlap between the ‘crypto’ and wider economy. Case in point the non-fungible token, or NFT: equally able to represent 100% digital goods (e.g. an in-game item) or a link to a real-world underlying asset (e.g. a share in a property).

At its simplest, a token, through the act of tokenisation, is no more than an empty programmable container recorded on the blockchain. As to what that token represents, that is becoming increasingly diverse in its interpretation – and agnostic to whether a token is created to be native to the blockchain and digital realm or whether it is a token with overlap into the ‘real asset’ world.²⁸ The token is a blank piece of paper, and we are becoming increasingly broad with what we write upon it.

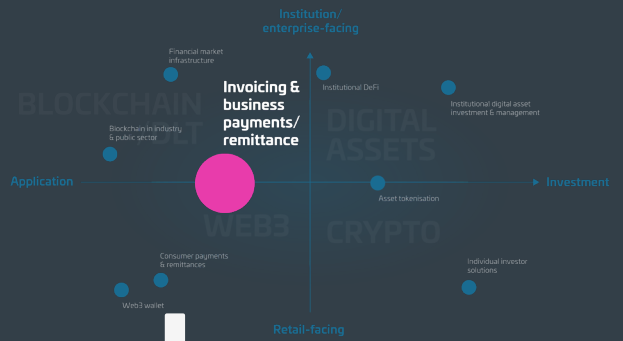
²⁸ At least technologically, if not from a legal and regulatory standpoint.

IN ACTION

Industry use cases

Project	Description
Aura blockchain consortium	Established by members including Prada Group, Cartier and Mercedes-Benz, Aura is a consortium initiative that uses the ERC-721 NFT tokenisation standard to trace and authenticate luxury products. ‘pNFTs’ are tokenised digital twins of physical objects used for purposes of provenance and traceability.

As elsewhere, generalisation and broadening of application is tokenisation’s theme: innovation incubated in the ‘crypto’ world that has now found its potential crossover into all sorts of areas of the mainstream economy. While, as with other emerging areas, we remain at the early exploration stage, especially where it comes to tokenisation of real world assets, it seems increasingly likely that aspects of tokenisation – whether for consumers, businesses, governments or financial market participants – will over time become an accepted and established part of everyday operations.



Chapter 5

Invoicing and business payments

At a glance

Blockchain evolution:	1.0 (payments)
Maturity of application:	Established
Enterprise participants:	Businesses, payments processors, fintechs ... banks, central banks
Market indicator:	\$150 trillion (estimated global cross-border B2B payments flow) ²⁹

The wholesale payments analogue

²⁹ Source: EY.

Just as transfer of value has been a staple of the consumer-focused use case since the first days of cryptocurrency, so too the same has come to be applied to the equivalent enterprise-focused operation. In many ways, much of the proposition – and the underpinning technology – remains the same, based on the premise that payments, whether by a consumer or by a business, can be slow, expensive and burdensome, and that blockchain solutions have potential to improve on this. However, the scope of the opportunity on the enterprise-facing side could be considered that much greater, given that the [volume of global B2B wholesale payments](#) outstrips that of consumer-related flows by a ratio of some 25 to 1.



Sendi Young
UK & Europe
Managing Director



“ We’re seeing more businesses using blockchain as a bridge to move money across borders to enable cheaper, more reliable and on demand transactions. For corporate treasurers, for instance, who are managing substantial pools of liquidity across multiple markets, the visibility and control that these payment rails provide is crucial. With their ability to increase the speed and efficiency of payments, and reduce costs, digital assets like CBDCs, stablecoins, and cryptocurrencies play a significant role in transforming the payments system. Ultimately, success will depend upon adoption and education as well as global regulations. ”

While the use case and basic infrastructure of payments may be the same, similarly to digital asset investment, needs and focuses may well be different based on the nature of operating requirements.

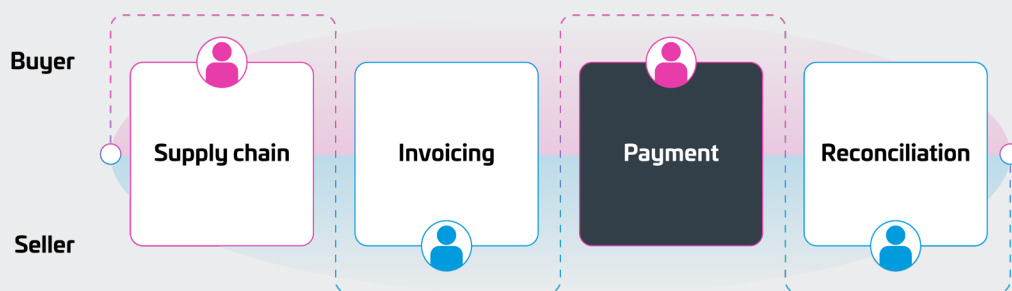
Applied to business payments, the unique operating factor is what we might call ‘embedding’: or the extent to which blockchain technology can be plugged into a payments flow as part of a wider end-to-end process. Executing payments between and on behalf of businesses as opposed to individuals means that business payments typically come with increased levels of documentation, systems and bureaucracy. The application of blockchain in the business payments context is therefore also a question of aiding and assisting that entire process, which involves not just the payment itself but also surrounding processes such as accounting and reconciliation; tracking and approvals of transfer requests; and invoicing/payments flows-related documentation. Enterprise applications do not just seek payment: they want for that to be embedded within the business’s wider operations and value chain, and to deliver recognisable efficiency, automation and streamlining gains in the process. Correspondingly, much of the research in the business payments landscape has focused equally on the interface of payments with complementary business processes such as supply chain and the wider e-commerce environment, where the transparency and ‘in-built bookkeeping’ of blockchain ledgers can offer significant advantages.³⁰

³⁰ See, for instance, [Lahkani \(2020\)](#) on Sustainable B2B E-Commerce and Blockchain-Based Supply Chain Finance or [Li \(2021\)](#) on a Blockchain-Based Cross-Border E-Business Payment Model.

IN ACTION
Industry use cases

Project	Description
Paystand	Paystand is a blockchain-enabled B2B payments network that allows businesses to transmit and manage money while integrating B2B payments with critical business tools such as ERP, eCommerce, CRM and accounting systems within a single platform.

Fig. 11: Embedded blockchain
B2B payments (and targets for blockchain-based efficiencies) are embedded in a ‘procure-to-pay’ process that encompasses supply chain procurement, invoicing and reconciliation as well as payment.



Source: Zumo/[Federal Reserve FedPayments Improvement](#) (adapted)

As we first raised in the context of consumer-targeted payments (*Chapter 2: Consumer payments & remittances*), B2B digital asset payments also raise the question of which digital asset payment instrument will become the most widespread in a landscape that encompasses emerging public money (CBDC) and commercial bank (tokenised deposits) variants as well as privately issued cryptoassets.

The traditional cryptocurrency dilemma has been that as fast, cheap and borderless as the blockchain component of a transfer might be, it still needs to be converted back to local fiat currency for as long as the cryptoasset in question is not commonly accepted as tender in the recipient's local economy. This goes doubly for businesses who, operationally and commercially speaking, want to reduce friction and conversion between currencies to the bare minimum, and account (and pay tax) for their business operations in sovereign currency.

As a result of this, cryptoasset-based payments are – at least at this early stage of adoption, and even more so in an enterprise context – faced with the inconvenience of requiring fiat on-off ramps to bridge back to local fiat currency at either end of a payments transaction. While well-known projects such as Stellar and Ripple, with its [intermediary XRP token](#), have focused on reducing this cost and friction to the minimum possible, having to bridge between the digital asset and fiat worlds in this way undeniably brings conversion fees, time and intermediaries back into the process, thereby undoing some of the blockchain-native advantages of the blockchain element of the payment.

Seen this way, prospective central bank digital currency equivalents have a potential competitive edge to offer inasmuch as such digital currencies are (subject to real-world rollout and legislative empowerment) likely to be accepted as legal tender without any further conversion being required. This makes it attractive for wholesale applications in domestic/single-currency-zone contexts, where blockchain/DLT-derived advantages (cost/speed/programmability/automated reconciliation) can potentially be realised without the awkwardness of the digital asset <> fiat bridge.³¹

³¹ Specific examples of this are explored in further detail in Chapter 9: 'Institutional DeFi'.

Where the picture becomes less clear is in the cross-border context, where cryptoassets in payments have traditionally claimed their greatest benefits, and where it still remains unclear the extent to which CBDC-based solutions would achieve the interoperability required to allow for cross-border payments along CBDC rails. Here, existing solutions such as fiat-referenced stablecoins or other cryptoassets may continue to play a role as the best readily available solution for realising payments efficiencies across borders – and all the more so the more that such assets are integrated by payments service providers as accepted forms of payment.



Mark Williamson
Managing Director

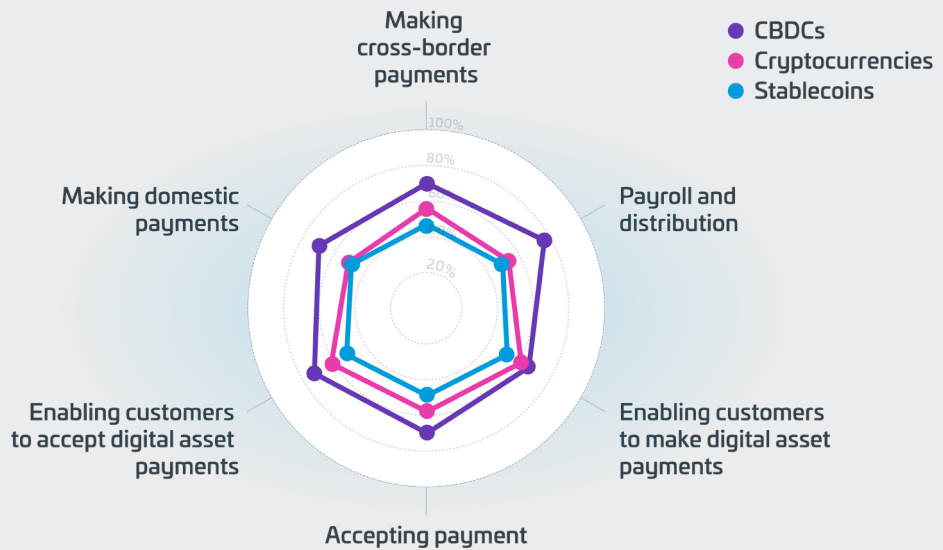


We've got to solve for this CBDC Rubik's cube. And so what I mean by that is wholesale, retail; token-based, account-based; domestic and cross border. On that, the other challenge we need to think about is from a primary market, secondary market and foreign exchange and securities services aspects.

The details of this are likely to evolve significantly over the coming years – with room for a variety of interoperable new digital asset payments instruments chosen as best fits the particular use case – and some of the current perspectives on the preferences for those various instruments among business and finance leaders are reflected in the figure below.

Fig. 12: Blockchain payments for enterprise

Payments use cases where finance leaders plan to use digital assets, together with their preferences for different types of payment asset.



Data: [Ripple](#)

IN ACTION

Industry use cases

Project	Description
Ripple	Ripple's On-Demand Liquidity (ODL) solution is designed to enable streamlined, more efficient cross-border transactions, giving corporates access to real-time global payments. Internal treasury, vendor, salary and bulk payments are cited as the largest areas of growth for the Ripple global payments network in the last year.

Opportunities

Given the potential operational efficiencies available, employing blockchain for business payments and surrounding processes has attracted the interest of a wide range of businesses and solutions providers seeking to exploit the technology's opportunities. This may commonly include:

- The opportunity to realise blockchain payments efficiency in the business payments context, including across borders
- The opportunity to embed this into further blockchain-based automation in surrounding procurement and supply chain processes
- The opportunity, as the digital asset payments ecosystem matures, to tap into new and emerging types of digital payment assets such as, for instance, central bank digital currencies, to realise incremental efficiency gains over time.

Considerations

Nevertheless, the application, due to the additional operating constraints and requirements inherent to a business, remains considerably more complex than its individual peer-to-peer counterpart. In the choice of solution, businesses are likely to encounter a common trade-off, where certain challenges can be mitigated by employing a fully managed intermediary solution, at the expense of additional fees, time and intermediary reliance. Some common considerations include:

- The treatment of chargebacks, reversibility of transactions, tech failures, and contractual obligations between parties in dispute situations, an issue which is identifiably different in the blockchain context and increases with the extent to which a solution relies solely on blockchain and blockchain-based automation and programming
- The need (at least in the current landscape) to convert into fiat currency at either end of a transaction to obtain readily usable tender
- The regulatory status of a business holding and accounting for digital assets, should those assets not be converted into fiat currency prior to the business's receipt of funds.

As a result of these types of complexities, the most common scenario in today's ecosystem is most likely one where a business relies on a third-party solutions provider to handle the blockchain/digital asset component of a payment transfer, with the choice to be abstracted away from the blockchain part as far as seeing nothing more than fiat currency deposited to their business account. The viability of such solutions of course resides in making such a solution still more efficient and cost effective than existing conventional payments rails – with the potential for businesses to become more involved in having exposure to the digital asset component itself as adoption and regulatory clarity increases.

Ecosystem interactions: reading between the lines

In saying this, we can follow where some of the relationships with other activities may likely lie. We have already mentioned supply chain and the embedding of B2B payments within it, and this speaks clearly to the Blockchain in Industry & Public Sector use case (*Chapter 6*). More than this, however, if we accept that businesses will increasingly accept – and choose to hold – variants of digital assets as part of their operations, we may also imagine that businesses of varying types will require digital asset treasury management services and solutions for the hold and transact components of those digital asset portfolios. This speaks to the corporate/institutional mirror of individual investor solutions and is addressed in further detail in the chapter on Institutional Digital Asset Investment and Management (*Chapter 8*). Building on that idea one step further, it also seems logical that, at the stage a business is holding and interacting with digital assets, it may also desire to expand into further digital-asset specific operations, be that putting those assets to work for a return within the Institutional DeFi ecosystem (*Chapter 9*) or employing digital assets within other types of financial operation where they become routinely employed over time (*Chapter 7: Financial Market Infrastructure*).

Finally, similarly to digital asset investment, the B2C (read consumer-focused) and B2B (read business-focused) angles of digital asset payments are knitted together (and lines blurred) through the fast-growing 'B2B2C' 'digital asset-as-a-service' proposition that sits adjacent to and across both categories. As we recall from our landscape introduction, this is characteristic of the 'blockchain 4.0' era, in which enterprises and institutions from the traditional sphere come, for the first time, to be digital asset interfaces to end consumers, powered by backend infrastructure sold into them from specialised digital asset solutions providers.

In the payments context, what that means is everyday businesses being in a position to accept digital asset payments from end consumers powered by infrastructure from a third party digital asset solutions provider. This could apply directly to the individual merchant, or equally it could apply to the payments service providers that support many business customers. On the merchant side, the headline incentive to embrace digital asset payments methods is potentially large, with the main upside of getting significantly more of the value of their customer payment³² as opposed to the combination of credit card processing fees, merchant account fees, service charges and authorisation fees that can **take as much as 6%** of a small business's sale.

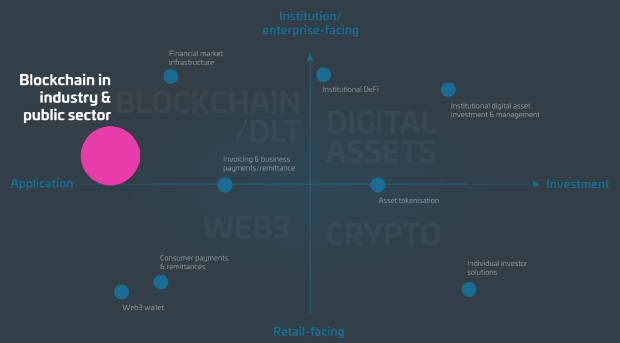
³² Up to 100% in the most favourable scenario of a merchant receiving a digital asset payment directly from the customer's blockchain wallet to theirs.

IN ACTION

Industry use cases

Project	Description
BitPay	Payments gateway Bitpay allows everyday businesses to accept crypto payments from their customers on their website, by email invoice, or in person at a retail location, providing them with the ability to integrate and receive cryptoasset payments in multiple currencies and receive funds settled in fiat, crypto or a mix of both.

On the flipside, in actuality the situation is not that clear cut: the merchant is exposed to digital asset volatility; they must bear the cost of converting to fiat if they wish to do so; and, should they employ a commercialised third-party solution to handle the support of digital asset payment methods, they will naturally incur intermediary fees as well. As we mentioned before, the determinant as to whether the alternative is worthwhile comes down to a question of whether the scenario is still more commercially attractive to the particular business than the existing arrangement. The variables to this (consumer demand, available digital asset types, requirements to bridge back to fiat, share of cross-border transactions, infrastructure cost and availability, regulatory clarity) are constantly in flux, and will bear a degree of subjectivity depending on how those factors evolve and a particular business's circumstances and assessment. Nevertheless, it is well worth remembering that digital asset payments are a topic that is highly relevant in both business and individually facing contexts, and that, in an enterprise context, solutions will continue to be developed that cater to both.



Chapter 6

Blockchain in industry & public sector

At a glance

- Blockchain evolution:** 2.0
- Maturity of application:** Developing
- Enterprise participants:** Corporates, SMEs, governments, public bodies, NGOs
- Market indicator:** ~\$10.41 billion (estimated enterprise blockchain market size 2022)³³

The ‘Enterprise’ original

³³ Source: estimates from [ResearchGate / Expert Market Research](#).

Other sections of this report have spent time analysing ‘enterprise’ in an extremely broad interpretation of any digital asset related service provided by a non-blockchain-native business, be that for a business or end consumer application. In this chapter, we will concentrate on what in many ways was the original enterprise interpretation, which was the harnessing and use of blockchain within industry and within companies’ own operations. As we have already seen, this is something that first emerged at an early stage of the ecosystem with the wave of blockchain development that followed Bitcoin. In the enterprise vision of circa 2015 – and the raft of enterprise-focused consortium projects that first emerged at that time – the objective was clear: apply blockchain or blockchain-derived concepts to be able to solve real-world business problems.³⁴

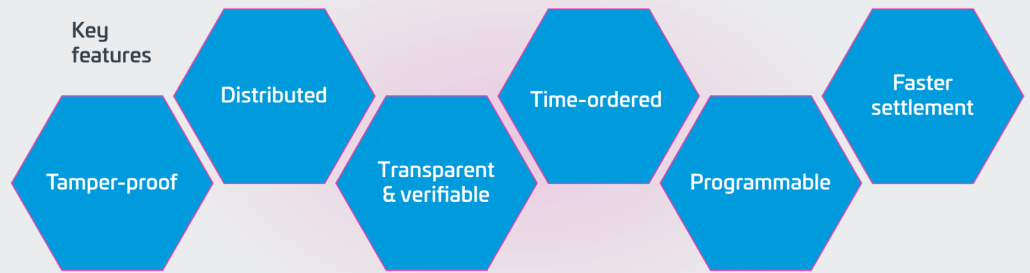
³⁴ See again [Richard Gendal Brown](#) for a potted overview of enterprise blockchain history.

IN ACTION Industry use cases

Project	Description
IBM Food Trust	IBM Food Trust is a modular solution built on blockchain to support a safer, smarter and more sustainable food ecosystem. The solution runs on the open-source Hyperledger Fabric and has processed millions of transactions on its network.

In this respect, there were a variety of properties that made blockchain appealing in perceived carryover to the enterprise business setting. These included tamper-proof and verifiable time-ordering of data (great for supply chain tracking and provenance, for instance); integrated programmability (harnessable for automation of business logic); and improved efficiency in settlement of transactions among counterparties (based on using the blockchain for network-managed, intermediary-free transaction, reconciliation and mutual trust).

Fig. 13: Why blockchain?
An overview of blockchain/DLT properties that have proven attractive in the enterprise setting.



Source: Zumo

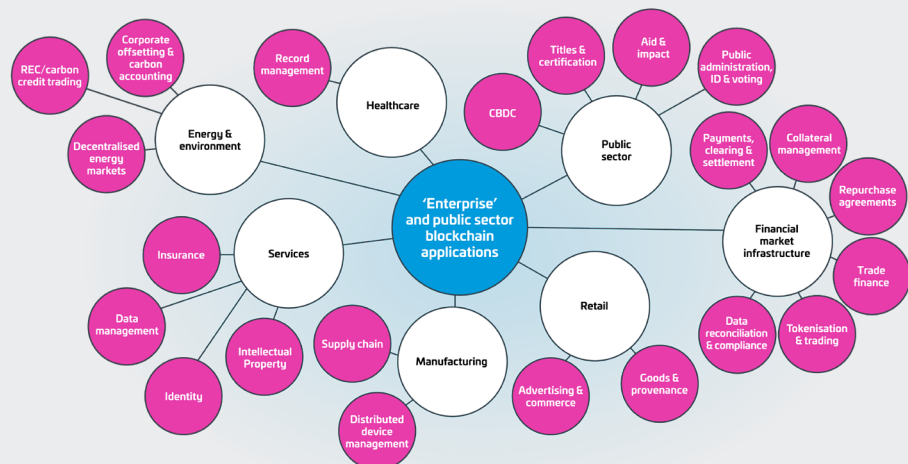
Accordingly, the business sectors in which blockchain has been posited (if not successfully implemented at scale) is incredibly broad and encompasses not only finance, but also the likes of insurance, manufacturing, automotive, energy, transportation, data, health, real estate, retail trade, and luxury goods.³⁵ This leads to a huge spectrum of potential application as (selectively) visualised in figure 14 below.

³⁵ See also Van Hijfte, [Blockchain and Industry Use Cases](#), for a further overview.

Notably, these applications spill over into the public sector and not just corporate settings, including [public interest aspects](#) such as digital identity, registries, public healthcare, foreign aid, administration and voting, not to mention the already discussed central bank digital currency.

As blockchain applications mature and become a more accepted part of the overall commercial and technology landscape, we can expect to see continuing and accelerating activity within existing enterprise and public body contexts. And in fact, as the companion guide at the close of this report explores in further detail, a large proportion of current exploratory applications and active participants come from precisely such applied 'non-crypto' use cases from within the financial services and public sector.

Fig. 14: Enterprise blockchain
A selected overview of current blockchain applications in broader industry and public sector contexts.



Opportunities

Lest we become too abstract in the evidently enormous scope of terrain to be found in this industry & public sector focused category, one ‘worked example’ reflective of recent development and enterprise interest lies in the application of blockchain to energy markets and ESG-conscious investing and business operations.

IN ACTION

Industry use cases

Project	Description
EDF/BNP Paribas	An early example of tokenisation for renewable financing, in 2022 energy firm EDF issued a tokenised bond for the financing of a solar energy project. Representing one of the first renewable energy bond tokenisations on the market, the native digital asset was structured, tokenised and distributed through BNP Paribas digital assets platform AssetFoundry.

Here, the problem and the solution can be framed in clear terms. Achieving net zero requires huge amounts of financing and coordination. And blockchain can be harnessed to open up that investment and action at a global scale: for instance, through the blockchain-enabled tokenisation and trading of a wide variety of ESG assets including Renewable Energy Certificates (RECs), carbon credits, sustainable infrastructure supporting bonds, and nature tokens to name but a few.

IN ACTION

Industry use cases

Project	Description
Zumo Oxygen	Zumo Oxygen is an enterprise-focused solution that matches electricity-based emissions associated with digital asset holdings with blockchain-verified Renewable Energy Certificates (RECs). The product was recently integrated in the offering of Europe’s first spot Bitcoin ETF, and forms part of a wider ambition to harness blockchain as a ‘digital enabler’ in tackling climate change and supporting the energy transition to a more sustainable infrastructure.

Where offset procurement processes have been obscure and OTC-dominated, there can be a transparent and public blockchain record; where liquidity constrained, pooled, more liquid marketplaces can be built; buy in bulk barriers replaced by fractionalisation to the smallest buyer amount; limited procurement choice supplanted by detailed provenance data; double counting risks offset by publicly consultable records; corporate-only climate mitigation avenues potentially democratised to a wider investor base.

In an ESG sense, then, exploratory blockchain solutions in the energy sector demonstrate some of the same core advantages we mentioned earlier in this chapter: transparency, settlement efficiency, and cryptographically engineered trust that opens up solutions across borders and intermediary boundaries.



Hirander Misra
Chairman & CEO,
GMEX Group/ZERO13



The application of blockchain in energy markets and the tokenisation of ESG assets offer exciting opportunities for increased efficiency, transparency, trust and sustainability. There are lots of vertical silos in the carbon credits and ESG space, which is where technology can act as an aggregator. Our initiative ZERO13, for instance, connects multiple international carbon exchanges, ESG markets, registries, custodians and ESG project owners globally for supply verification, transparent pricing and real-time settlement using APIs and across blockchains.

This creates a unique opportunity to harness ‘blockchain for good’ – including driving that change at a business/enterprise level – in order to:

- Deliver improved market infrastructure and financing routes in support of wider corporate, governmental and societal ESG objectives
- Support solutions for direct intervention and proof for stakeholders in accounting for climate impacts
- Reach new levels of transparency and rigour in reporting and verification/provenance.

IN ACTION

Industry use cases

Project	Description
CCData	CCData’s ESG Benchmark methodology empowers the crypto industry by instilling a heightened sense of responsibility for sustainability. By emphasising critical environmental, social and governance metrics, it provides the industry with a robust classification to effectively score assets based on ESG compliance. This promotes responsible investment and broadens accessibility to crypto, particularly for large players with ESG mandates.

Considerations

On the flipside, blockchain is never the panacea that can cure all ills, and realising its benefits in the ESG context is reliant on solving some identifiable accompanying challenges that include:

- How to ensure the fundamental robustness and methodological rigour of ESG assets tokenised on the blockchain and avoid the ‘garbage in, garbage out’ problem of trading instruments that have not been sufficiently vetted and verified in their environmental claims
- The need to ensure the sufficient interoperability between blockchain solutions that allows for a full and transparent picture of activity at a global level, a necessary condition if blockchain is to provide any effective transparency against issues such as double counting
- The recognition that at this early stage current solutions will be ‘digital twins’ based on tokenising assets (such as carbon credits) that exist in conventional form in existing registries as opposed to being natively issued blockchain assets.³⁶ This then raises operational questions, common to the area of tokenisation, as to what the token represents and the ownership rights associated with it, as well as maintaining the reliance on trust in registry providers and their proper conduct in the tokenisation process.

³⁶ As explained in section 6 of this [excellent guide](#) to carbon credit tokenisation.

Despite this, the area remains an area of significant current initiative and promise, and we can expect that a thoughtful approach that remains alive to challenges as well as opportunities will be able to find the path that retains blockchain benefits while successfully embedding that into the wider environmental and operational context.

CASE STUDY

A perspective on blockchain, web3 and metaverse for climate action



Dr Jane Thomason
Author, web3 and metaverse thought leader

“Green digital asset solutions, carbon markets, decentralised energy trading, smart grid management, NFTs, DAOs, incentivization and transparent measurement and reporting are all ways blockchain and web3 can be deployed for climate action. Metaverse and immersive reality will enable the use of Digital Twins across energy, water, and telecoms networks to enable the examination of climate projections and impacts. Digital twins and augmented reality can simulate natural disasters through real-time interaction and accurate 3D registration of virtual and real objects. It is early days for metaverse, but the value of digital twins and virtual experiences are also expected to be deployed for climate action. Collaboration will continue to be crucial in developing and adapting web3, blockchain, metaverse and other technology-based solutions that support climate actions, bringing together the global community to scale climate action. A key element to scaling will be mobilising capital through sustainable finance initiatives for climate action through green digital asset solutions, green bonds, fintech solutions, and alternative finance mechanisms.”

Ecosystem interactions: different but same

Broadly considered, blockchain in industry and the public sector has interactions and interfaces with almost every chapter of this report, with a particular emphasis on the banking and finance industry, which of course still comprises the bulk of the ‘industry’ use case and so receives its own standalone chapter (*Chapter 7: Financial Market Infrastructure*).

Interestingly, despite the differing emphases in focus, we can observe that the key building blocks in industry and enterprise-focused use cases – tokenisation, wallet infrastructure, programmability or payments flows, say – in essence remain the same.³⁷ We are left with the impression of ‘different but same’: yes, solutions may vary in their mechanics and permissions, or the specific digital asset instruments they employ, but at their core these are repeating ideas transported over into another context.

³⁷ As should be evident from the ESG tokenisation example we have just considered.

This is an important thread to follow, as one of the key developments in the entire ‘enterprise’ thesis is that of integration and connectivity: the idea that what we are seeing is a gradual merge and mainstreaming of blockchain technology in all its forms, and that this necessarily results in a world where lines that were previously clearly distinguished become ever more and more blurred.

As we have already argued in this report, we can see this in the provision of solutions by non-crypto-native enterprises to the end consumer and the increasing linkages that exist between the ‘tradfi’ and decentralised finance worlds.

More and more, integration and connectivity is the desired state, leading to increasing interoperability and adjacency not just between specific blockchains,³⁸ but critically, also between the private, permissioned environments of ‘enterprise’ blockchain and the open, permissionless environments of today’s public, open-sourced blockchains.³⁹

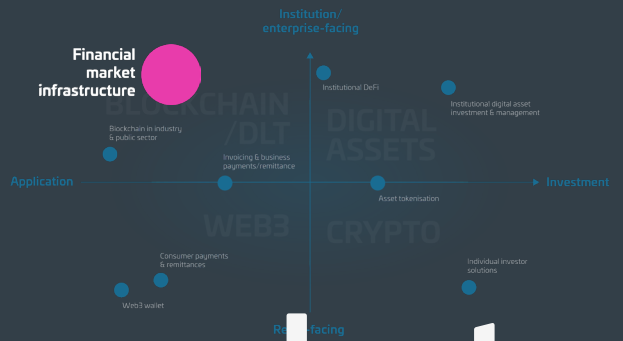
³⁸ As represented, for instance, by projects such as [Polkadot](#) or [Cosmos](#).

³⁹ In other words, a ‘[tiered architecture](#)’ where private blockchains are connected and able to communicate with public blockchains.

This sort of connectivity between the private and the public, the old and the new is taking on more and more importance, and can be seen in the range of current projects to have recently released new products aimed at precisely this interface. This includes some extremely high-profile initiatives such as Chainlink’s Cross-Chain Interoperability Protocol (CCIP), a [partnership with SWIFT and major financial institutions](#) targeted at unlocking seamless transfer of tokenised value over both private and public blockchain networks, as well as Quant’s newly extended [Overledger platform](#) that aims to meet similar enterprise needs across any blockchain environment.

In short, unlocking value through connectivity remains a major theme in every area of the blockchain space and, in a decade’s time, it seems likely that some of the distinctions we draw today around ‘enterprise’ or ‘public blockchain’ use cases may not be distinctions we need draw any longer, at least at the user experience level.⁴⁰

⁴⁰ Interestingly, this is already seen among enterprise DLT users, of whom increasing proportions are looking to ‘public blockchain with application permissioning’ (Broadridge 2023, [p. 16](#)) as opposed to fully public or fully private blockchain implementations.



Chapter 7

Financial market infrastructure

At a glance

Blockchain evolution:	2.0
Maturity of application:	Developing
Enterprise participants:	Banks, financial institutions, banking clients, central banks
Market indicator:	~\$22.46 billion (forecast market size for blockchain use in banking & financial services 2026) ⁴¹

Levers of efficiency

⁴¹ Source: [Statista / Mindsmith](#)

⁴² See the 'Enterprise evolution' companion guide at the close of this report.

As we noted in our previous chapter looking at blockchain in the broader industry and public sector, banking and finance still accounts for the lion's share of activity within the industry enterprise use case, with financial services applications accounting for some two-fifths of the global blockchain market by end-use sector.⁴² And even as banks and the wider financial services sector contend with the potential disintermediating forces advanced by public blockchain alternatives and, equally within an established context, the exploration of retail-level CBDCs, blockchain continues to attract interest within those institutions as a lever of efficiency to improve and update core operations while continuing to leverage incumbent position and advantages.

Echoing our December 2022 [Route to Crypto Acceptance report](#), finance leaders continue to see strong potential in the harnessing of blockchain for intra and inter-institutional operations, and this is supported by the [92% of banking industry respondents](#) that are or plan to implement blockchain-based processes. The key word here is efficiency optimisation, which has in itself been estimated to harbour [billion-dollar-level incremental gains](#).



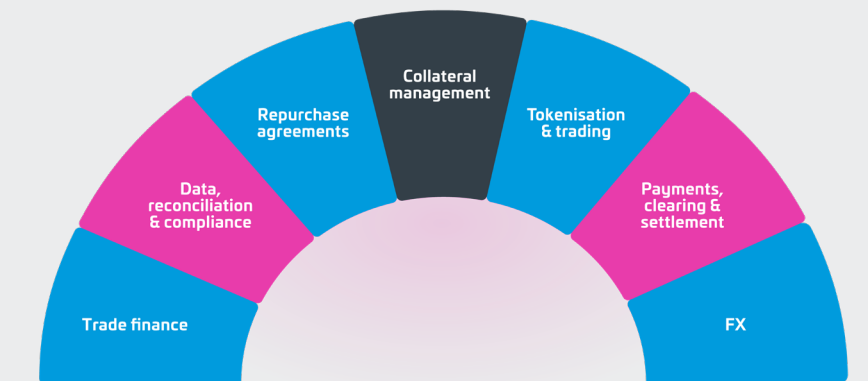
Mark Williamson
Managing Director



If you're able to get better visibility, transparency and workflow of cash moving through the system, then you're able to release a lot of trapped liquidity in the marketplace. Part of the challenge around traditional markets is that a lot of the assets are trapped in inefficient settlement layers. So having a settlement layer that's able to sort that out is important.

Applied to the core banking and finance operations, this has generally [been presented in two main buckets](#): on the one hand, the ways in which banks and financial institutions around the world collaborate and interact with each other and, on the other, the ways in which data and information can be exchanged, shared and reconciled.

Fig. 15:
Future of finance?
Select banking and finance/
financial services blockchain
use cases.



Source: Zumo

⁴³ Participants include Banco Santander, BNY Mellon, Barclays, CIBC, Commerzbank, Credit Suisse, Euroclear, ING, KBC Group, Lloyds Banking Group, Mizuho Financial Group, MUFG Bank, Nasdaq, Nomura, Sumitomo Mitsui Banking Corporation, State Street Corporation, and UBS.

This has given rise to some notable initiatives across the broad area of financial market infrastructure. In terms of interbank collaboration, projects such as [Finality](#)⁴³ have brought together some of the biggest names in banking to explore the use of distributed ledger technology (DLT) for interbank settlement – coordination work that has only continued and broadened with further recent high-profile consortium initiatives such as the [Canton](#) blockchain network. In parallel, this private-sector impetus has been met with increasing central bank exploration, with notable wholesale CBDC projects initiated by the [Monetary Authority of Singapore](#), [Hong Kong Monetary Authority](#) and [Bank for International Settlements](#) in recent years. On the data processing side, the likes of JPMorgan’s [Liink](#) or HSBC’s [Digital Vault](#) have probed the optimisation of information transfer, reconciliation and data access based on DLT tech, accompanied by the emerging opportunity to bring blockchain to the streamlining and embedding of compliance processes such as AML/KYC, both by [applying blockchain solutions to the KYC process](#) or by [directly embedding compliance rules](#) in the programming of digital assets.

IN ACTION
Industry use cases

Project	Description
FX Everywhere	HSBC’s FX Everywhere solution uses distributed ledger technology to confirm and pay FX trades, primarily across the bank’s many internal balance sheets in countries worldwide. FX Everywhere is one of the biggest and most established DLT solutions in financial markets, having settled some six and a quarter trillion dollars since going live in 2018. The solution has significantly reduced costs and reliance on external settlement networks for the bank, for which roughly 45% of all FX volume is intrabank activity around funding and risk.

IN ACTION

Industry use cases

Project	Description
Liink	Developed by JPMorgan, the blockchain-based Liink network is described as a bank-led, peer-to-peer network for secure, privacy-preserving information exchange. Functionality includes services for bank account verification, check match and currency conversion decision-making. The network currently has more than 96 organisations and more than 95 million transactions since launch.

When coupled with financial services innovation in areas such as tokenisation and facilitation of B2B cross-border payments – not to mention the increasing institutional engagement on the crypto and digital asset side – it becomes clear that financial institutions are likely to only increase their already prominent role in the enterprise ecosystem of the future.



Tony Petrov
Chief Legal Officer



Blockchain is not only cryptocurrencies, and the distributed ledger technologies go far beyond crypto. For example, you can use blockchain to record transactions in a ledger, and once entered, the record is virtually impossible to erase. At the same time, the whole philosophy of blockchain is centred around automated procedures not requiring human involvement. Therefore, blockchain-based infrastructures are more secure, cheaper, less prone to making mistakes, and – at the end of the day – a more immediate way of processing transactions.



Opportunities

With their established position, brand, resources, and compliance and financial knowledge base, blockchain offers financial institutions significant opportunities to optimise their offering and re-engineer core processes for improved transparency and efficiency. These opportunities include:

- Minimising frictions and inefficiencies in counterparty, interbank and bank/central bank transactions, with particular areas of focus in settlement, payments, trade finance, foreign exchange and post-trade operations
- Bringing accessibility, security, interoperability and shared transparency to data processes including information exchange, reconciliation among parties, access to data and embedded compliance
- Using this base of blockchain and DLT knowledge to embrace and foster new innovation in adjacent areas, for instance creating new investment products such as tokenised securities or funds, or facilitating cryptoasset investments.

IN ACTION

Industry use cases

Project	Description
HQLA-X	HQLA-x’s DLT-based collateral management platform allows clients to boost collateral mobility, achieve certainty in transfer timing and optimise their collateral management by facilitating DLT-enabled functionality that addresses frictions around settlement processes and the custody chain. Global custodians and Triparty Agents include Bank of New York Mellon, BNP Securities Services, Citibank, Clearstream, Euroclear, and J.P. Morgan.

Considerations

As developments that touch on integral processes and extremely high-value systems, blockchain-based applications within the banking and finance sector are significant undertakings requiring thorough assessment and testing. Equally, given that they often involve the systems that link and connect parties in the financial system, they are also dependent on collaboration and a shared vision. This yields some important considerations including:

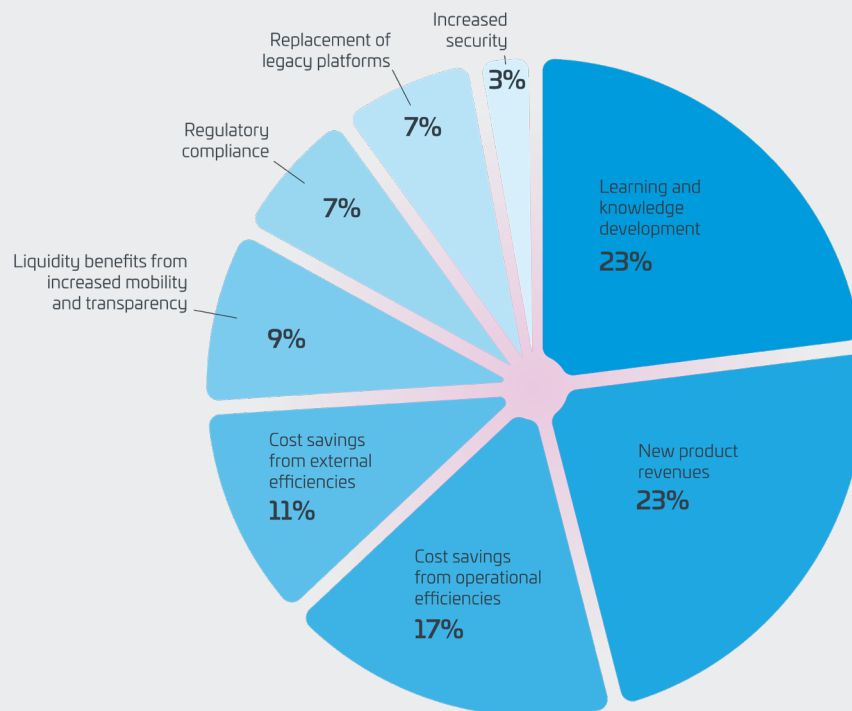
- Who is to take responsibility (and legal liability) in the event of the failure or unexpected performance of a DLT or blockchain-based distributed system⁴⁴
- A consideration of whether all of the features of decentralised systems are desirable in the intended context: for instance whether counterparties [want to maintain](#) the on-demand liquidity required to satisfy instantaneous settlements; whether the public transparency of transaction information is always preferred; or whether parties have the willingness to assume self-custody of digital assets
- And finally, the measures by which assessments are made of demand, market readiness and the industry-level buy-in needed to deliver a return on investment and sufficient scale for realisation of system benefits. This includes the need for an awareness of the siloes that may emerge if initiatives are pursued privately and concurrently in non-interoperable contexts and an appreciation of the current levels of industry-wide appetite for DLT engagement.⁴⁵

⁴⁴ See also [Bank of England](#), December 2022.

⁴⁵ European Central Bank analysis ([ECB](#), February 2023, p. 8) puts DLT adoption rates at around 50% of banks that currently use or are exploring DLT applications, which is significantly less than AI, cloud computing or API technology.

At this early stage, these are still questions in the process of being answered (similarly to central bank digital currency, much of the emphasis is on early exploration, learning and development) – albeit the scale of initiatives and pilot projects already underway bears witness to the engagement within the industry and the longer term direction of travel.

Fig. 16: Gaining a DLT foothold
Cited business case drivers among financial services DLT adopters.



Source: [Broadridge DLT in the Real World 2023 Survey](#)

Ecosystem interactions: the foot in the door

Quite evidently, the sheer variety of blockchain-inspired processes currently being examined by banks and financial institutions means that their activities inevitably interface with multiple other of the chapters covered in this report. This includes the trend towards blockchain representation of existing asset classes such as stocks, bonds and differing types of ‘real-world assets’ (*Chapter 4: Asset tokenisation*); the interaction of institutionally driven blockchain efforts with B2B value transfer, cross-border payments and international trade (*Chapter 5: Invoicing and business payments*); and the institutional finance applications of blockchain programmability and automation (*Chapter 9: Institutional DeFi*).

But there is another interaction, too, in the interrelationship between financial institutions’ explorations of blockchain in their ‘own-use’ intra-organisation operations and their (later) engagement externally in the digital asset investment arena. Just as we have tracked the progression of industry-focused ‘enterprise blockchain’ applications towards those same enterprises offering external, customer-focused solutions, so too early bank blockchain initiatives have often preceded more public, investment-focused engagement. JPMorgan is perhaps the archetypal example of this ‘foot in the door’ progression, being one of the very first adopters in testing private versions of blockchain technology and later on the first major US bank to offer access to Bitcoin and other crypto funds to its wealth management clients.⁴⁶

⁴⁶ See [here](#) for a more detailed exposition of the JPMorgan evolution.

The progression makes a lot of sense if familiarity with blockchain has already been gradually built up within the business, and belies the broadening scope of where interest has come to lie. In fact, banks and financial institutions have in recent years been significant investors in crypto and digital assets in the investment product sense,⁴⁷ as we will explore in further detail in our next chapter on Institutional Digital Asset Investment and Management.

⁴⁷ Top investors include Morgan Stanley (\$1.1B); Goldman Sachs (\$698M); BNY Mellon (\$690M); Commonwealth Bank (\$421M); and Citi (\$215M).

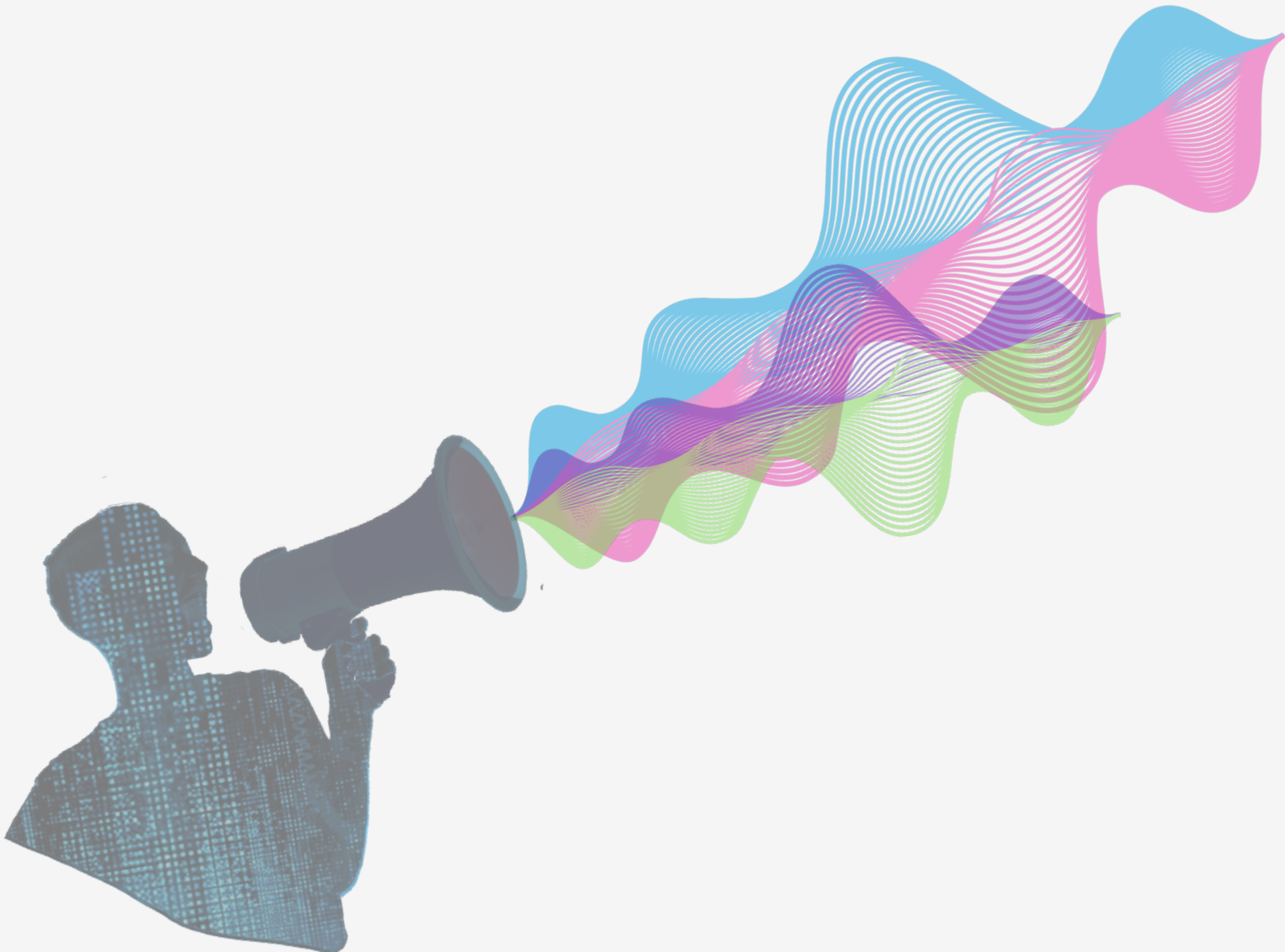
Simply put, large institutions will likely have many concurrent initiatives pursuing different angles within the very broad landscape of the digital asset enterprise ecosystem – and it pays to keep an eye on the big picture throughout.

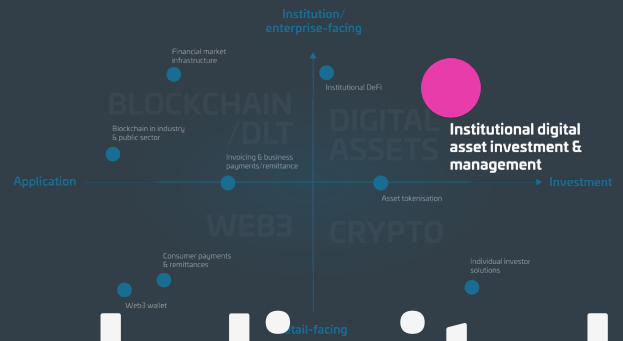


Nitin Gaur
Global Head of Digital Asset &
Technology Design



“ Digital asset technologies, such as asset tokenization and blockchain, are disruptive by nature and flatten business processing by shifting from asynchronous dissemination of information to more synchronous dissemination. This simple, technology-induced shift disrupts various elements of current market infrastructure providers, including access, global trading, process efficiency, regulation and compliance, and connectivity to markets. And the resulting data provides insights for business analysis and fuels RegTech. ”





Chapter 8

Institutional digital asset investment & management

At a glance

Blockchain evolution:	3.0
Maturity of application:	Early
Enterprise participants:	Asset managers, financial institutions, brokerages, corporates, hedge funds, family offices & HNW
Market indicator:	~\$16 billion (assets under management in Grayscale Bitcoin Trust) ⁴⁸

The professionalisation of digital asset investment

⁴⁸ Source: [Grayscale](#) (as retrieved on 2 September 2023).

In established asset classes and developed markets, we are used to seeing institutional investors hold far greater claims of ownership than individuals, with the [OECD](#) placing institutional ownership of US listed firms at north of 70%, and figures from the [UK's Office of National Statistics](#) putting individual ownership of UK quoted shares at 12%.

⁴⁹ *Estimated figure* as at 12 August 2023.

As a young and developing asset class, this is not yet the case in digital assets even in the instance of its largest single asset Bitcoin – and indeed the current situation points to an almost inverse situation, with the institutional ownership of Bitcoin as a reference asset hovering somewhere closer to 10%.⁴⁹ Nevertheless, institutional investors [expect that to change](#), and change quickly, with a majority of professional investors anticipating that institutions will hold the majority of digital assets by the end of the decade. And that means it is early innings for the potential market development in institutional digital asset investment and management.

Today we see this playing out in two channels, on both the sell and buy sides of the digital asset investment marketplace.

IN ACTION

Industry use cases

Project	Description
Jacobi FT Wilshire Bitcoin ETF	Listed on Euronext Amsterdam in August 2023, the Jacobi FT Wilshire Bitcoin ETF is Europe’s first spot bitcoin ETF that draws on Zumo as a technology provider to verifiably match bitcoin electricity consumption with renewables.

On the one hand, the range of available digital asset investment products continues to expand. Bitcoin futures contracts have been tradeable since the end of 2017, and ether futures since early 2021; on top of it, significant amounts have continued to flow into institutionally offered products, which range from ETFs holding futures contracts or stocks of companies with exposure to the digital asset ecosystem (including, for instance, bitcoin miner ETFs or blockchain strategy funds); Bitcoin ETFs or similar products that have emerged in countries outside of the US including Canada, Australia, Germany, Brazil and Dubai; and Grayscale’s flagship Bitcoin Investment Trust, which claims tens of billions in assets under management.

IN ACTION

Industry use cases

Project	Description
Grayscale Bitcoin Trust	The Grayscale Bitcoin Investment Trust is a tradable security solely and passively invested in BTC. The investment trust currently owns over 3.4% of all Bitcoin in circulation. GBTC shares, which are not redeemable for underlying Bitcoin, are offered through a private placement process, making them available only to accredited investors and subject to a six-month holding period.

Famously, of course, a spot Bitcoin ETF in the US with the flexible share creation/redemption mechanism to ensure that the fund closely tracks underlying net asset value has remained elusive.⁵⁰ With ongoing SEC concerns around risks for market manipulation and fraud, this is a testament to the established finance rules digital asset investment products must comply with, both in trading arrangements and indeed less obvious around the edges considerations such as ESG.

⁵⁰ Without this, products such as the Grayscale Bitcoin Investment Trust have [traded at significant premiums/discounts](#) to the underlying asset.



Martin Bednall

CEO

Jacobi ASSET MANAGEMENT

ETFs are undeniably the entry point for widespread adoption, attracting investors who were previously hesitant thanks to the elimination of technical barriers and underlying asset risks. However, product providers face multiple challenges, including varying global regulations, slow-moving traditional institutions, and the need for increased liquidity. We believe Europe will be the next market to deliver this type of product for institutional investors, which has helped to legitimise Bitcoin as an investment asset, in turn signalling mainstream acceptance.

⁵¹ Including the proposal of trading venue surveillance-sharing agreements to address market manipulation.

When this is ultimately resolved, however (and, at the time of writing, there are a raft of filings currently under consideration,⁵¹ with optimism stoked by a [landmark court ruling](#) vacating the SEC’s decision to block the conversion of the Grayscale Bitcoin Trust into a spot Bitcoin ETF), the wall of capital is likely to be considerable. Following prominent spot Bitcoin ETF filings in the US, this is already evident in the [largest run of inflows](#) into digital asset investment products since 2021. And more generally, it points to a future in which digital asset investment is accessible at a whole new level and scale, allowing for investor participation in closely tracked digital asset performance from the convenience of a brokerage account while supplying lucrative opportunities for providers and managers of digital asset investment products.

Fig. 17: ETF groundswell
Spot Bitcoin ETF applications filed in the US in 2023.

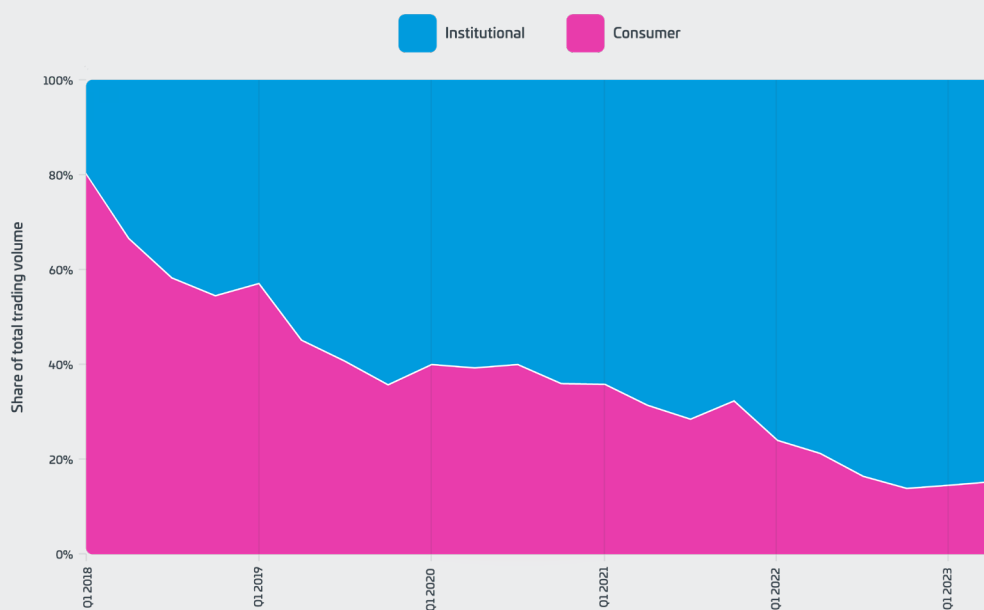
ETF name	Issuer	Filing date
ARK 21Shares Bitcoin ETF	ARK, 21Shares	25/4/23
iShares Bitcoin Trust	BlackRock	15/6/23
Bitwise Bitcoin ETP Trust	Bitwise Asset Management	16/6/23
Invesco Galaxy Bitcoin ETF	Invesco	20/6/23
WisdomTree Bitcoin Trust	WisdomTree	20/6/23
Valkyrie Bitcoin Fund	Valkyrie	21/6/23
Wise Origin Bitcoin Trust	Fidelity	29/6/23

Source: [Bloomberg/SEC](#)

⁵² Surveys of institutional investor sentiment, for example, have shown that almost 70% intend to increase allocations to digital assets and related products in the next two to three years (EY).

As this plays out, we can expect to see a corresponding growth in buy-side demand for robust solutions for the trading and management of digital asset holdings.⁵² Aside from the custody of digital assets for fund and asset managers, this encompasses the increasing range of institutional market participants – whether corporates, hedge funds, family offices or market makers – who wish to be active in trading and managing a digital asset portfolio. The result is an institutional investor class with a need for tailored digital asset solutions to deliver functionality encompassing treasury management, custody, institutional-grade trading services, and integrated online platforms to manage operations, data, access, administration and oversight.

Fig. 18: The rise of the institutional investor
Evolution of trading volume split between consumer and institutional investor categories (Coinbase exchange, 2018-2023).



Data: [Coinbase SEC filings](#); [The Block](#)

For active institutional market participants, primary concerns likely include the competitiveness of the trading experience (liquidity, supported assets, fees) coupled with the appropriate regulatory and operating environment from which to conduct that activity.⁵³ As we move forwards, institutional participants will expect the same sort of overall service and liquidity they get in established contexts, and this is evidenced in the increasing range of institutionally targeted digital asset investment and management platforms, including those backed by players in the established finance world.

⁵³ Cf. [PwC 2022 Crypto Trading Report](#), figure 8.

IN ACTION
Industry use cases

Project	Description
EDX Markets	Launched in June 2023, EDX Markets is an institutional digital asset exchange backed by Citadel Securities, Fidelity Digital Assets, Charles Schwab Corporation, Virtu Financial, Sequoia, Paradigm, and others. EDX aims to enable safer, faster and more efficient trading and settlement of digital assets, leveraging best practices from traditional financial markets on a purpose-built crypto platform.

⁵⁴ See also Coinbase's [2022 Institutional Investor Digital Assets Outlook](#).

Regardless of individual context, however, there seems to be an emerging consensus on the key factors – compliance, security, and trust – that characterise the digital asset investment platform of the future.⁵⁴

Opportunities

Given the continuing march of digital asset investment into the ‘institutional’ era, players in this space have the opportunity to capitalise, at a relatively early stage, on the mainstreaming and growth of this asset class. This may include:

- On the sell side, the opportunity to offer high-quality, regulated digital asset products that can absorb large investor and institutional investor demand at new scale and with new convenience by opening up widespread access to an increasing range of digital assets
- On the buy side, the opportunity for professional investors to actively participate in the digital asset ecosystem via a range of increasingly accessible institutionally-oriented venues, and therefore benefit from the diversification opportunities and new asset types and investment applications that the digital asset ecosystem has to offer
- In aggregate, the opportunity to meet the ongoing need for infrastructure and solutions that can prioritise trusted service, compliance and ESG investment factors in a maturing market and setting.

Considerations

Equally, however, there remain clearly identifiable hurdles that, while the overall direction of travel may be positive, any prospective investor has to consider. Some of these include:

- The regulation and operational clarity question, which applies not just to the regulation of assets themselves, but also the whole surrounding operation and infrastructure: trading venues; taxation rules; financial reporting; ESG alignment; technology integration; advisory services; and data, analytics and valuation models
- Market and asset-specific considerations such as liquidity, volatility and inefficiency, and the risks of market manipulation
- Finally, the learning curve (and required strategic alignment) that comes with embracing digital asset exposure, including choices around digital asset custody, preferred technology, and understanding the risks and opportunities associated with the asset class.

In the balance, evidence is mounting that emerging opportunities are considered to outweigh the risk for more and more organisations and investors, at least at the exploratory stage.

Ecosystem interactions: ‘investing plus’

As we mentioned back in the opening chapter of this report (*Chapter 1: Individual investor solutions*), institutional digital asset investment and management is the institutional mirror of digital asset investment solutions for the retail consumer, and revolves around much of the same core custody, trading and wallet management functionality.

And, just as for individuals, the institution or enterprise’s initial investment action can often function as an entry gateway to other activities and exploration within the digital asset ecosystem. As in the chapter that follows (*Chapter 9: Institutional DeFi*), this may take the form of investor activities unique to the asset class, such as the staking of assets or participation in decentralised governance; or as in *Chapter 3: the web3 wallet* it may venture more in the direction of portfolio diversification, and the addition to treasury portfolios not only of new subsets of asset such as the NFT, but also an understanding of the digital asset wallet as the hub from which to access all manner of emerging blockchain-powered solutions, from identity credentials to data storage services to company carbon offsets.

In the process, we are reminded of the rapid broadening of available asset types under the digital assets umbrella, its adjacency to the theme of tokenisation and real-world assets (*Chapter 4: Asset tokenisation*), and the increasing extent to which cryptoassets and other types of digital assets – tokenised investment funds, tokenised securities, tokenised commodities – will sit alongside and complement one another in holistic offerings from digital asset providers.⁵⁵

⁵⁵ As one example of this, in July 2023 WisdomTree launched [WisdomTree Prime](#), a digital assets mobile app allowing investors to gain exposure to cryptocurrencies, tokenised gold and blockchain-tracked WisdomTree ‘digital funds’ from a single venue.

In short, what it means to be an investor and holder of digital assets is evolving and expanding all the time, and that is no different for the institutional investor.

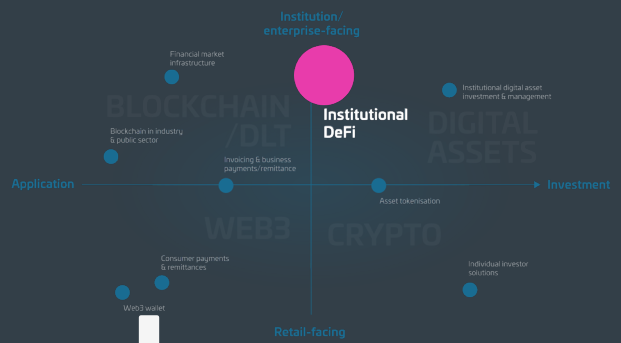


Jeff Billingham
Director of Strategic Initiatives



From our vantage point, many financial institutions that focus on the institutional markets are using this period of economic and regulatory uncertainty to strengthen their in-house compliance expertise in anticipation of future adoption and demand for digital assets. This takes the form of education and training for their compliance leads, enhanced policies and procedures that accommodate the unique aspects of this industry, and access to tools that identify and prevent the illicit use of digital assets. This tends to be a multi-year effort, especially for businesses with a global footprint across several financial service segments.

Once this groundwork is in place, we expect that financial institutions will likely see future success across four key opportunities: digital asset-business banking, digital asset-wealth management, exposure to the digital asset-spot or derivatives markets, or digital asset custody services.



Chapter 9

Institutional DeFi

At a glance

Blockchain evolution:	3.0
Maturity of application:	Early
Enterprise participants:	Banks, central banks, corporates, hedge funds, institutional investors
Market indicator:	~\$41.64 billion (total value locked in DeFi applications in August 2023) ⁵⁶

Innovation and assimilation?

⁵⁶ Source: [DefiLlama](#) (as retrieved on 11 August 2023).

⁵⁷ For readers interested in more background context to the innovations and efficiencies introduced by DeFi, an overview is provided by [Fabian Schär](#) and a much more deep-dive description by the [Bank for International Settlements](#).

⁵⁸ ‘Staking’ refers to holding and ‘locking up’ cryptocurrency to support network operations and earn rewards.

⁵⁹ ‘Decentralised’ or ‘onchain’ governance refers to the process of using blockchain technology for decentralised decision-making and protocol updates by token holders.

⁶⁰ Managed, institutional investor focused staking providers include businesses such as [Figment](#) and [Kiln](#), with others such as [Anchorage Digital](#) offering equivalent services for governance participation.

⁶¹ For instance, PwC’s 2022 crypto trading firm report ([p.24](#)) finds that over a third use decentralised exchanges, or DEXs, for cryptoasset trading.

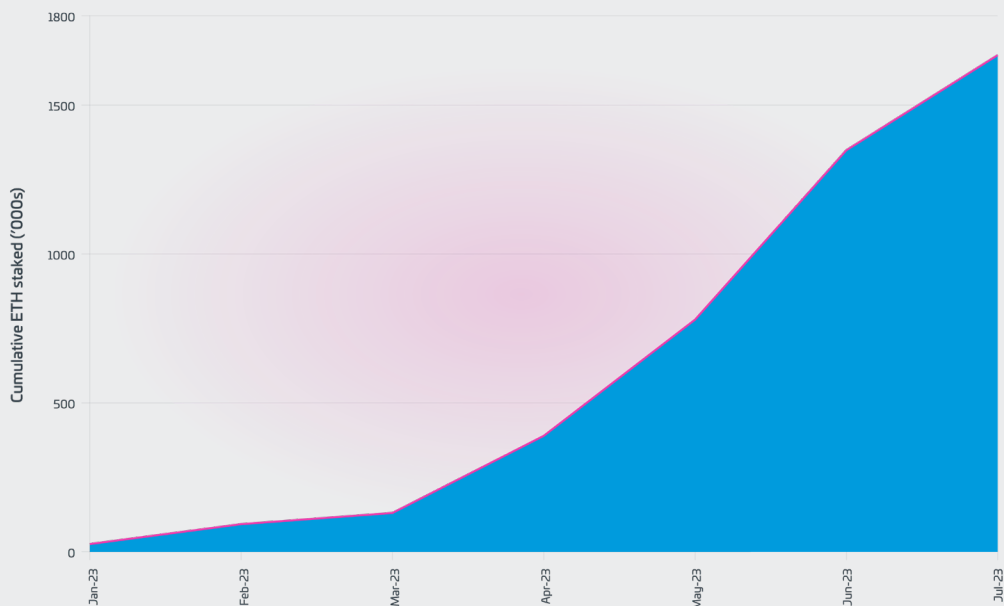
⁶² One such example being [Aave Arc](#), a permissioned, institutional version of the popular Aave borrow/lend DeFi protocol.

Increasingly, digital assets are interesting not only as assets, as we discussed in our last chapter, but also as the vehicle (supported by blockchain technology) that has enabled some completely new ways of executing financial operations: a space that has collectively come to be known as DeFi, or decentralised finance. At its core, DeFi builds on the programmability functionality we identified as a key evolution in blockchain development to allow financial operations (such as asset swaps, borrowing, lending or fund transfers) to happen without intermediary and governed entirely by coded agreements, known as smart contracts, that live and run on an underpinning blockchain.⁵⁷ The complication, of course, is that institutions inevitably find themselves unable to interact with these protocols – which are open, permissionless, borderless and used entirely at own risk – in the same way as the individual investor. The question remains: how to harness some of the innovation without falling foul of the rules? Institutional DeFi is one answer to that challenge and, as observers have [neatly put it](#), seeks to combine the efficiency and innovation of decentralised finance with a level of safeguards that is expected from financial institutions.

This happens slowly and then all at once. As in other areas of the ecosystem, the term ‘Institutional DeFi’ in itself contains several angles and nuance. Most modestly – but also most immediately – we might point to the rapid growth in managed solutions that allow institutional investors to participate in actions such as staking⁵⁸ or blockchain-based governance⁵⁹ that are unique to the digital asset class. Originally handled principally at the individual level, and self-custodially, the emergence of institutionally-focused (and indeed retail-focused) infrastructure providers to offer such services on investors’ behalf⁶⁰ has widened participation in such activities significantly. Arguably, too, it has provided the transition entry point for institutional players to participate in further, explicitly DeFi-related activities such as trading in decentralised venues (DEXs)⁶¹ or providing digital asset liquidity for decentralised borrow/lend operations.⁶²

Fig. 19: Professional stake
Year-to-date growth in ether (ETH) staking deposits from institutionally targeted staking providers among the top 10 ETH staking entities.⁶³

⁶³ Aggregated figure for providers within the top 10 entities (by amount of ETH staked) identified as marketing primarily to institutional customers: Kiln, Figment, Bitcoin Suisse and Staked.us. As at 11 August 2023, a cumulative lifetime 2.79 million ETH (or roughly 10% of the supply currently staked) had been staked via these providers – interestingly, a proportion roughly equivalent to the percentage of Bitcoin (cf. chapter 8) currently estimated to be institutional hands.

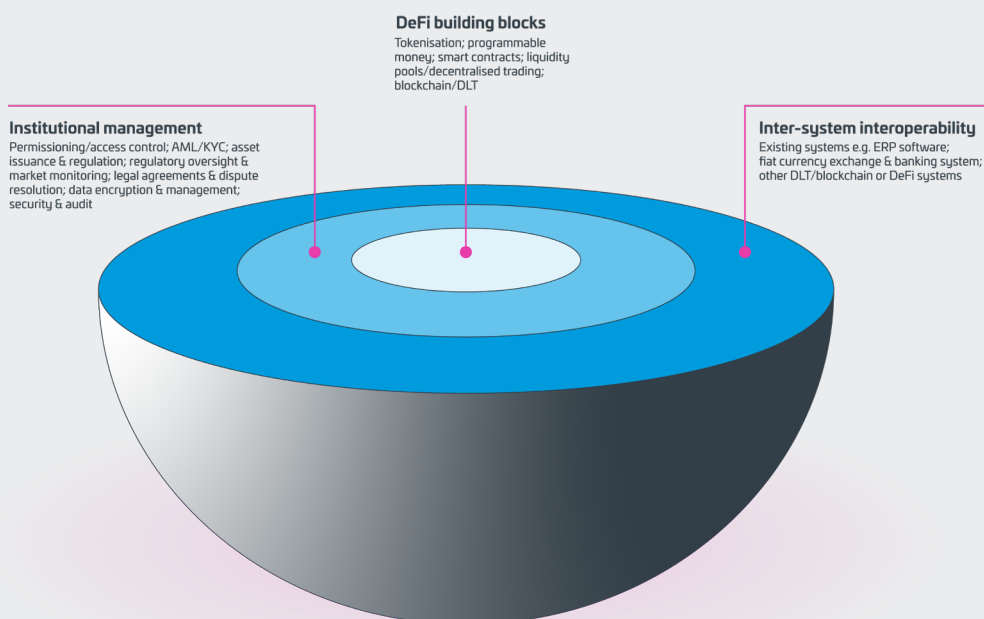


Data: Dune Analytics

Extending it one stage further, there are those (primarily central banks with enterprise and financial institution collaboration) who have taken the process forward another step again in beginning to explore the real-world ‘DeFi-inspired’ applications that could be implemented, with added controls, in an institutional and regulated setting. Increasingly, these applications are what gives ‘Institutional DeFi’ its name, and are based on the core principle of taking useful building blocks from the decentralised finance world and harnessing them in an institutional context.⁶⁴ The emerging examples of this are many and speak to the potential identified in partnering regulated solutions, controlled venues, real-world assets, and state-backed digital currency with the blockchain-derived benefits and programmability characteristics of distributed ledger technology and decentralised finance.

⁶⁴ One such definition is offered in the joint report ‘[Institutional DeFi: the next generation of finance](#)’ (p.8), which refers to the ‘application of DeFi protocols to tokenized real-world assets, combined with appropriate safeguards to ensure financial integrity, regulatory compliance, and customer protection’.

Fig. 20: Under the hood of ‘Institutional DeFi’
Institutional DeFi as the combination of DeFi building blocks, institutional management and inter-system interoperability.



Source: Zumo

Such solutions are designed to address known problems in the existing economy in a trusted, technology-enabled way. These include initiatives from the [Bank of Thailand](#) and [Bank for International Settlements](#) to leverage programmability and digital currency to tackle pain points around SME financing; a [cross-industry collaboration](#) including JPMorgan and the Monetary Authority of Singapore that targets financial use cases combining asset tokenisation and DeFi in a regulated context; a [pilot](#) from the Federal Reserve Bank of New York’s New York Innovation Center to improve trading and reduce counterparty risk in illiquid currency exchange pairs; and a large-scale CBDC use case pilot programme from the [Reserve Bank of Australia](#) to integrate digital currency and DLT technology into the real economy. Multiple of these projects are described in more detail in the use case highlights accompanying this chapter.

IN ACTION

Industry use cases

Project	Description
Project Guardian	Project Guardian is a collaborative initiative between the Monetary Authority of Singapore and the financial industry that seeks to test the feasibility of applications in asset tokenisation and DeFi while managing risks to financial stability and integrity. Pilot initiatives span asset & wealth management, fixed income and foreign exchange, with a first industry pilot exploring potential decentralised finance (DeFi) applications in wholesale funding markets, featuring DBS Bank, JPMorgan and SBI Digital Asset Holdings.

In the larger view, we can therefore summarise that there are two clearly distinguishable strands to the current Institutional DeFi narrative: the first relating to ‘DeFi-facilitated’ activities such as staking, governance, and decentralised trading and financial operations; and the second relating to ‘defi-inspired’ applications as applied by institutions to the real-world economy. While still at a very early stage of development, this remains an area to be closely monitored alongside accompanying institutionally driven tokenisation and digital currency themes.



Julian Sawyer
CEO



Institutional investors are actively seeking a reliable, secure, and compliant partner to participate in the dynamic DeFi ecosystem, and capitalise on the potential that arises from participation in the digital asset space. Staking integrations, for instance, allow clients to earn a potential yield in exchange for participating in blockchain network security activities. And integration with registered financial entities offers the potential to earn yield on tokenised T-bills and other real-world assets while assets are held in custody.

Opportunities

For enterprise participants looking at DeFi and its potential carry-over to the institutional setting, this leaves a wide range of avenues to consider, both in the short and longer-term.

These opportunities include:

- In the nearest term, the opportunity for existing professional/institutional digital asset holders and investors to take advantage of staking and other ecosystem-related activities with a view to gaining yield on their current portfolio, accessing alternative (decentralised) trading venues and participating in asset-specific activities such as governance
- For enterprises and institutions, the opportunity to collaborate together to explore and benefit from new programmable and tokenised applications that are emerging based on building blocks first introduced within the DeFi ecosystem, and adapt these to the specific needs of the established finance setting
- As a result, the wider long-term opportunity for financial services providers and their end business customers to benefit from initiatives that not only optimise existing financial operations and processes, but also innovate new solutions that would not have been possible before.

IN ACTION

Industry use cases

Project	Description
Bank of Thailand	The Bank of Thailand is currently exploring applications for SME financing via programmable money and tokenisation. Under the proposed solution, SME invoices are tokenised and made available to lenders to purchase at a given rate of return based on a system of smart contracts, and a hypothetical programmable CBDC issued via The Bank of Thailand used to broker the transactions.

IN ACTION

Industry use cases

Project	Description
Reserve Bank of Australia	The Reserve Bank of Australia is currently partnering with the Digital Finance Cooperative Research Centre (DFCRC) on a research project to explore potential use cases and economic benefits of a central bank digital currency (CBDC) in Australia. Pilot use cases drawing on DeFi-derived building blocks include programmable payments for the construction supply chain and a concept for livestock auction.

Considerations

With this said, longer-term aspirations in particular must come with a recognition of the current state of development and the operating constraints such ideas are subject to. Some notable considerations include:

- The reliance on the regulatory regime to make such solutions viable in the first place. Given the still extremely early stage of development of key institutional DeFi components such as central bank digital currency and real-world asset tokenisation, in practice this means a likely reliance on sandbox/pilot-style environments as the only ground to develop such ideas in the immediate term with any operational certainty
- The implications of applying a permissioned structure to DeFi-derived building blocks which, while offering benefits of management and control, constrains participation – and therefore liquidity – and risks re-applying many of the borders and frictions for which decentralised finance was supposed to solve⁶⁵
- Finally, the difficulty – and sheer time – needed to achieve scale and end user adoption for significantly new solutions that introduce new and not yet widely understood types of technical, legal and operational risk.

⁶⁵ This also risks a ‘parallel track’ with DeFi, where permissioned and permissionless solutions evolve without significant dialogue, overlap or interaction one with the other.

These are not questions to which we can expect defined answers in the immediate term; nevertheless, the exploration continues to gain pace and certainly plays host to some of the more interesting corners of the digital asset enterprise landscape.

Ecosystem interactions: a two-way street

As we noted in our previous chapter (*Chapter 8: Institutional digital asset investment & management*), Institutional DeFi in the investment activity sense maintains close links as an extension of institutional investment and treasury management. And as newly conceptualised end-to-end solutions, applied Institutional DeFi initiatives also draw holistically on the component elements of tokenisation (*Chapter 4: Asset tokenisation*) and payments/digital currency (*Chapter 5: Invoicing and business payments*) we have treated individually in other sections of this report.

⁶⁶ For example, in June 2023, DeFi pioneer Robert Leshner launched [Superstate](#), a new company founded to bring traditional assets onto the blockchain, starting with a tokenised fund holding short-term government debt.

⁶⁷ See [this dashboard](#) for a useful overview of the wide range of initiatives active in this area.

⁶⁸ ‘DeFi’ providing technology and tradeability, and ‘TradFi’ providing the routes for tokenisation of real-world assets.

⁶⁹ The idea of the symbiotic relationship comes from the OECD’s Iota-Kaousar Nassr and Catherine Roulet, who propose in a [paper for the Journal of Digital Banking](#) ways in which, for instance, DeFi pools could constitute the currently lacking secondary market for regulated tokenised assets.

Most interesting, perhaps, is the two-way evolution we can begin to observe between the young and still younger ‘DeFi’ and ‘Institutional DeFi’ narratives. For as much as we see DeFi building blocks being transferred over into institutional and regulated contexts, so too we can observe a countertrend in the opposite direction, with ‘original DeFi’ showing increasing willingness to embrace and embed traditional asset classes such as tokenised treasuries or tokenised funds,⁶⁶ and in turn engineering its own versions of decentralised applications drawing on various types of tokenised real-world assets.⁶⁷

In this sense, we might speculate as to the gradual merging and convergence of (Institutional) DeFi distinctions around the tokenisation of the real-world economy,⁶⁸ and a future in which the two can enter into a ‘symbiotic relationship’ that bridges permissioned and permissionless contexts, and provides added utility and features to both.⁶⁹

Robert Leshner
 Founder
 Compound Labs/Superstate



All of the reasons that people love DeFi are eventually going to exist for traditional assets.



CONCLUSION

‘Digital assets’ is a fast-evolving term still in the process of being defined in the enterprise context.

But as this report goes to show, it is also a call to action: to begin strategic assessments; to further learning and knowledge; ultimately, to gain one’s own experience and foothold in the digital asset age.

As we have seen, exploration and development activity continues to move apace in and between the many different tracks of the ecosystem: now, it is up to enterprise to chart its course.



Companion guide

The enterprise evolution

The development of the digital asset ecosystem and what it means for enterprise

Today's big picture view of the digital asset enterprise ecosystem stems from a simple analysis: broadening in application; broadening in participation.

In this companion guide, we trace the contours of that evolution in further detail through a closer examination of the dominant trends in use cases and active participants, and how this has translated over into the enterprise context.

The data picture: applications

→ Cryptoasset use cases are widening

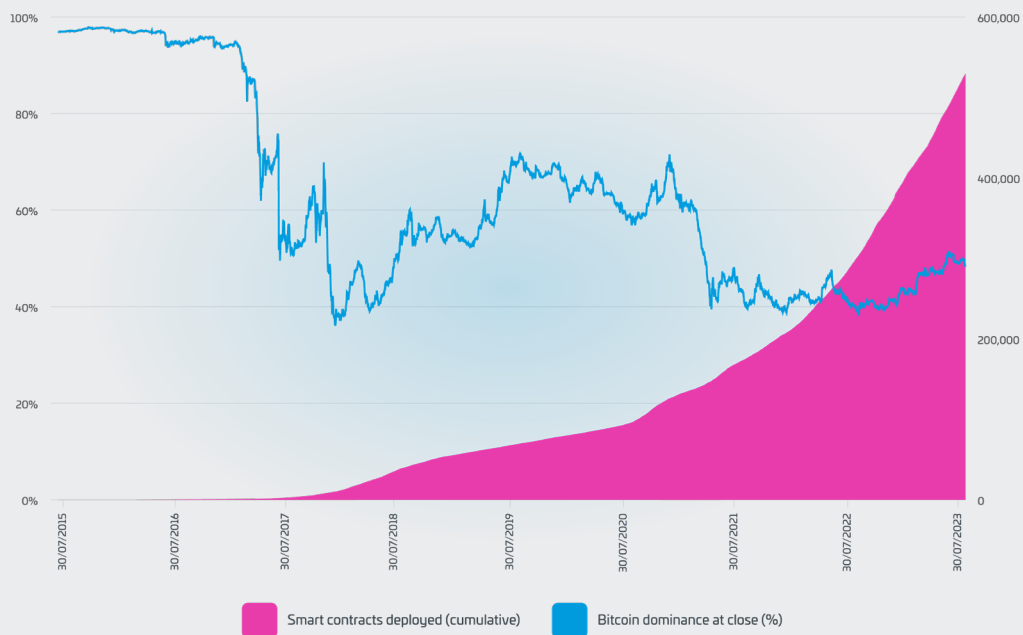
⁷⁰ Clearly, this is a rough approximation; however, it does form a confluence with similar lenses. For instance, a closer analysis of Ethereum blockspace utilisation ([Ark Invest](#)) shows around 10% usage for simple asset transfers, and the other 90% split between e.g. applied payments (stablecoins), financial operations (DeFi) as well as emerging use cases (ERC-20 tokens and NFTs) that may represent completely non-financialised use cases such as gaming, entertainment, participation in governance or access to utility services, as supported by [Chainalysis's holistic web3 analysis](#). Similarly, 530 out of 1199 early-stage fundraising rounds in H1 2022 went to web3 and NFT projects ([Messari/Dove Metrics](#)).

The ways in which blockchains are used has developed significantly over time. As we have mentioned, this has been defined by programmability: as blockchains have become able to do more over time, so by the same token more diversified applications have emerged.

In a consumer-facing cryptoasset context, the examples of this are many – often couched under buzzwords such as DeFi, NFTs or web3 – and, notably, stand in contrast to the Bitcoin monetary/investment strand that has evolved to coalesce around the 'digital gold' narrative.

Figure 21 suggests just how much this balance has shifted over time using Ethereum smart contract deployments (coded logic stored on the blockchain) as a rough proxy for programmed applications and Bitcoin dominance (Bitcoin's percentage share of total cryptoasset market capitalisation) as a proxy for the core monetary and investment crypto-currency narrative.⁷⁰

Fig. 21:
Investment vs application
Bitcoin cedes dominance,
smart contract deployments
continue to rise.



Data: etherscan, [daily verified contracts](#); TradingView, [bitcoin dominance](#)
As at 20 August 2023

Mirrored in other channels, the broader conclusion is that the longer-term direction of travel is towards diversified utility and application use cases to accompany core investment and monetary narratives.

For enterprise, this opens up opportunities to engage and be active not only across consumer-targeted investment but also developing payments, DeFi and web3 enterprise opportunities.

→ ...and non-crypto use cases are, too

The same spirit of utility-driven experimentation is seen in the more institutionally-facing context, where there is a similar story to tell in the progress of blockchain applications outside of cryptoassets, and the [wide range of blockchain-derived use cases](#) found within almost all sectors of the economy.

As we observed in our tracing of the blockchain evolution, enterprise blockchain, that is to say the integration of blockchain or blockchain-derived technology into non-crypto-native companies' operations, is a market that was non-existent prior to 2015 or so; today, it is [estimated to be used](#) by 77 of the top 100 public companies worldwide and [valued](#) at \$10.41 billion.

Interestingly, this is a particular area of blockchain focus that has experienced a renaissance and, to a certain extent, reinvention in the '4.0' era based on converging developments we have touched upon, including the growing involvement of government actors, the accompanying first strokes of regulatory frameworks, and the increasing involvement of non-crypto business in productisation and service provision. In aggregate, this has combined to result in a surge of pilot and experimental 'non-crypto' activity revolving around the emerging themes of central bank digital currency; collaborative (public and private sector) financial market infrastructure projects; and exploration of products and offerings based on tokenisation of existing asset classes. This is correspondingly reflected in the 2023 make-up of 'enterprise' applications.⁷¹

⁷¹At the same time, enterprise applications such as data & security and, increasingly, environmental and social impact focused initiatives, have increased in prominence alongside long-standing areas of interest such as supply chain/provenance and titles/certification. As context to these points, it is interesting to make the comparison with the enterprise landscape of previous years as, for instance, presented by the Cambridge Centre for Alternative Finance (2019) p. 34.

Fig. 22:
Use case breakdown
of current 'non-
crypto' projects⁷²
 Blockchain-derived applications continue to extend across banking, finance and commerce.

⁷² Based on a categorisation of 82 projects from public database repositories identified as primarily institutionally offered, industry-focused or enterprise facing.

Data: [CFTE blockchain projects directory](#); [Polygon use case database](#)



For enterprise today, the opportunity is to tap into these fast-moving developments to update and optimise existing systems of finance and commerce.

The data picture: participants

▶ Investor demand for digital assets continues to widen

Inextricably linked to these developments is the broadening of participants alongside applications. We may recall, the hallmark of this is the progression from an individually-targeted starting point towards a more and more enterprise and institutionally driven landscape. And as with applications, this is a thread that may be followed both inside the cryptoasset space and outside of it.

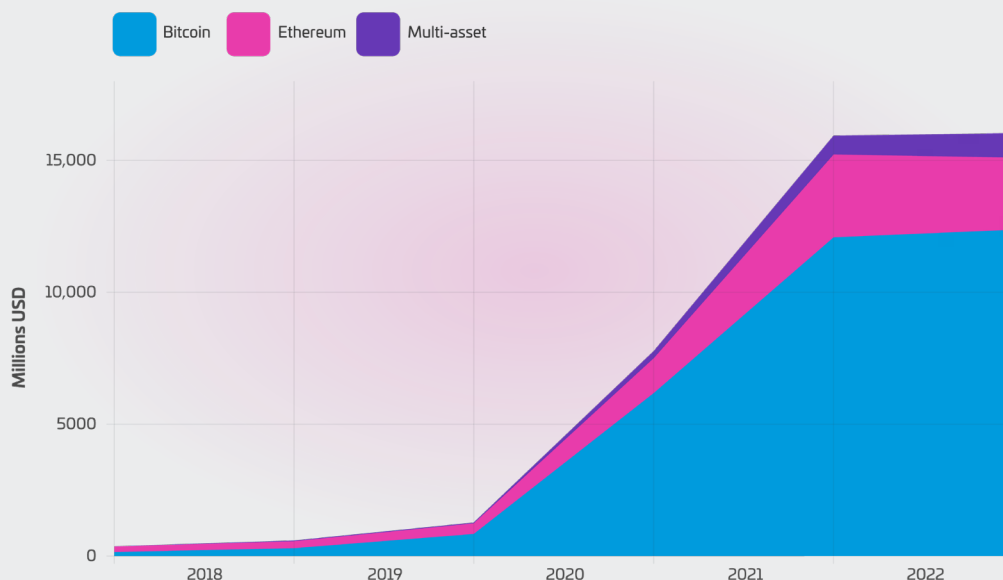
Within crypto, access to futures, funds and other investment products launched from within established financial institutions has steadily professionalised and broadened the investor base from the point of its first mainstreaming in the circa 2017 era. Even after challenging market conditions in 2022, [records of digital asset fund flows](#) show an aggregated ~\$32.3 billion in assets under management in digital asset investment products as at August 2023, supported by a 2020/21 surge in investment.

And in a similar vein, [analysis of global crypto hedge fund activity](#) estimates over 300 active hedge funds, over half of which were created within the last three years – and almost all since 2017. As we identified in our evolution of blockchain, this popularised and progressively institutionalised view of digital assets as an investment vehicle has significantly broadened the range of participants active in the space.

Even before the widespread global availability of spot ETF products, for enterprise participants this provides emerging opportunities on both buy and sell sides of the institutional digital asset investment space.

Fig. 23:
Cumulative digital asset funds flow by selected asset (millions, USD)

Fund flows to institutionally offered digital asset investment products have accumulated significantly since 2017, with a particular groundswell since 2020.



Data: [Coinshares](#), data to end 2022

→ ...as does the range of participants offering new blockchain solutions

Outside of cryptoassets, too, new actors bring new solutions. Staying with the broadening theme, both central banks and financial institutions have shown striking willingness to add and integrate blockchain-derived solutions into existing financial infrastructure. [Nine out of 10 central banks](#) are currently exploring central bank digital currencies, and [polling suggests](#) a similar percentage of institutional investors are interested in tokenised products – including every asset manager with more than \$1 trillion assets under management.

Even if such initiatives remain at an early and exploratory stage, the potential longer-term implications are significant. As per [forward forecasting](#), both tokenisation and central bank digital currency in isolation could represent some \$5 trillion of value apiece by the end of the decade – contrasted against a total cryptoasset market capitalisation of some \$1.02 trillion as at the time of writing.

Such trends depend on, and are driven by, the ongoing engagement of new enterprise participants, in this case in the financial services and public sector (read government/central bank) slices of the enterprise pie. These emerging actors not only combine to compound the growth effects that have been observed in cryptoassets; they also point to what with time could be some of the most material new participants and applications in the overall digital asset space.

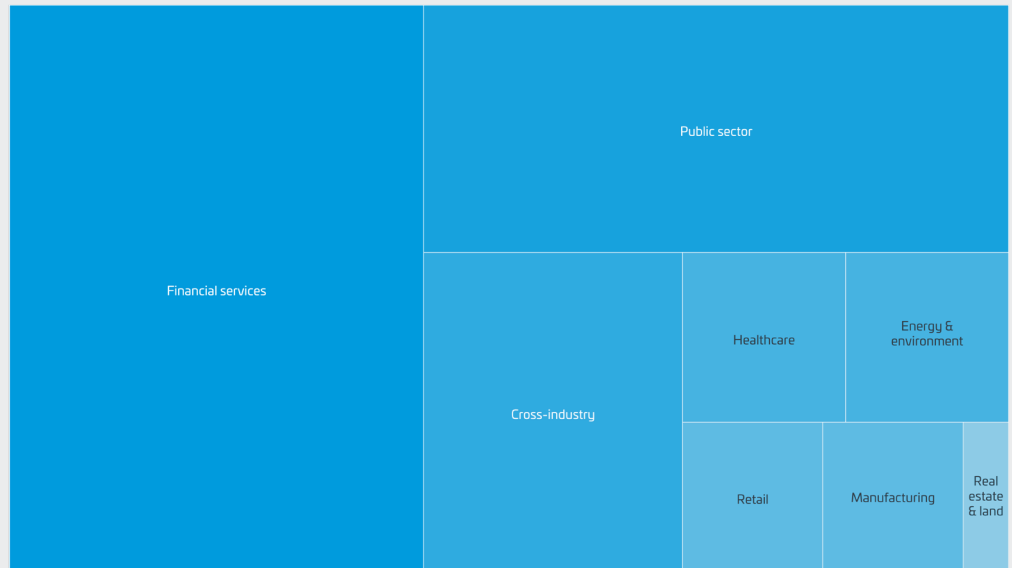
From an enterprise perspective, new players have the opportunity to leverage their existing position to provide some of the largest-scale and most widely adopted blockchain/DLT-based solutions of the future, and this is beginning to show through in the balance of participants involved in DLT projects outside of the cryptoasset niche.

Fig. 24: Breakdown by sector of enterprise participants in the blockchain/DLT space⁷³

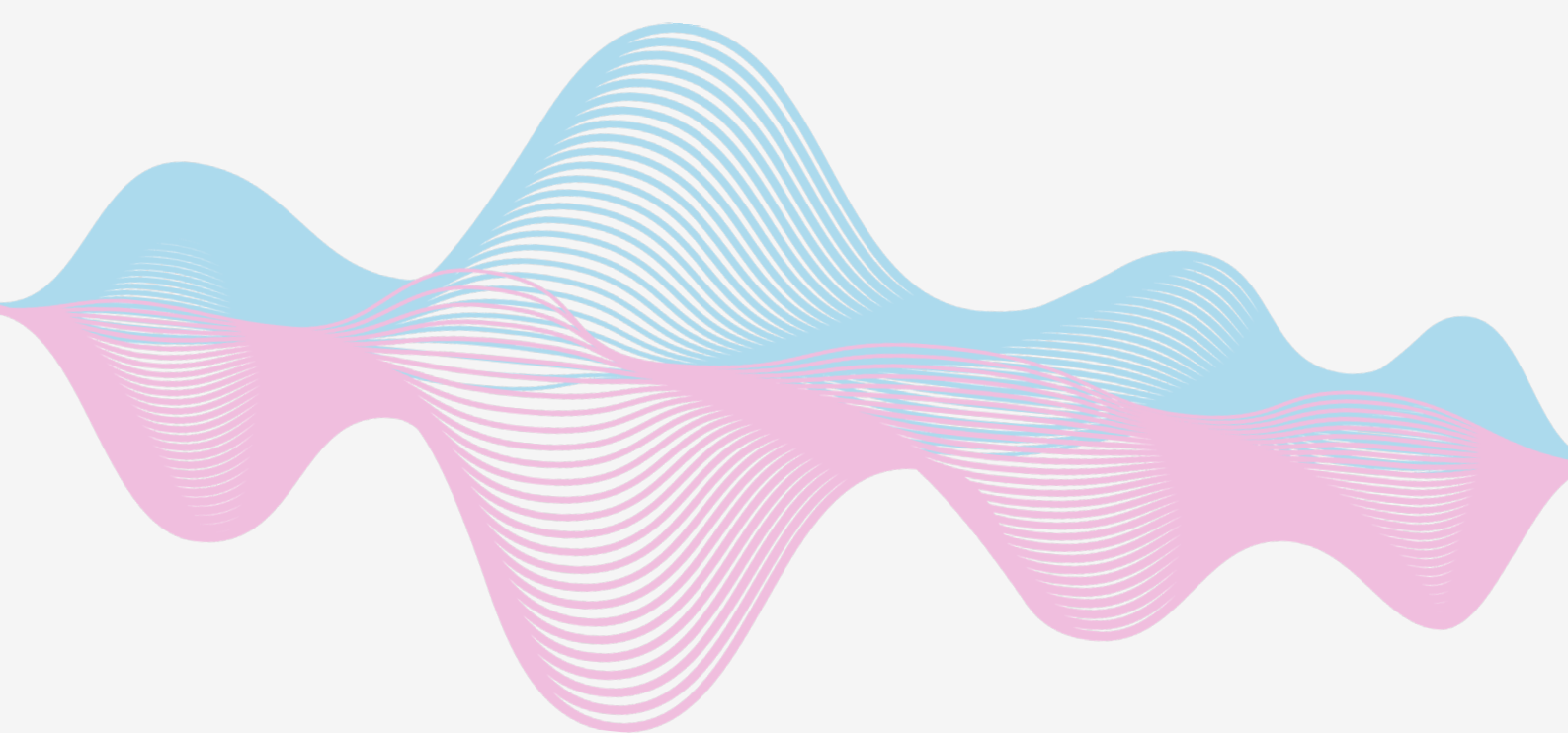
Financial services and, increasingly, public sector/government too, dominate current blockchain/DLT initiatives outside of the cryptoasset space.

⁷³ Based on a categorisation of 82 projects from public database repositories identified as primarily institutionally offered, industry-focused or enterprise facing.

Data: [CFTE blockchain projects directory](#); [Polygon use case database](#)



In short: the enterprise era is here, and it is both more applied and more institutional.



Appendix

Community voices contributors



Christopher Agathangelou

Head of Digital Capital Markets and Flow Credit



Daniel Ahmed

Co-Founder and COO



Martin Bednall

CEO



Jeff Billingham

Director of Strategic Initiatives



Nitin Gaur

Global Head of Digital Asset & Technology Design



Emma Kerr

Senior Vice President & Head of Strategic Partnerships Europe



Sean Kiernan

CEO



Paula Kilgarriff

Web3 Brand Activation Consultant & Retail Innovation Lecturer



Hirander Misra

Chairman & CEO





Jannah Patchay
Director;
Executive Director / Policy Lead



Tony Petrov
Chief Legal Officer



Julian Sawyer
CEO



Dr Jane Thomason
Author, web3 and
metaverse thought leader



Mark Williamson
Managing Director



Sendi Young
UK & Europe Managing Director



Tom Zschach
Chief Innovation Officer



Full quotations

Christopher Agathangelou

Head of Digital Capital Markets and Flow Credit, NatWest Markets

“At NatWest, we see great potential in tokenisation of traditional assets* and adoption of enhanced market infrastructure to serve our customers better. We are investing in building digital issuance capability to support our Commercial and Institutional customers, engaging in open conversations to educate, and encourage challenge from, our customers, as well as peers.

It is truly exciting to see the material uptick in activity in the market for digital bonds over the past year, but also mindful of the fact that the existing market could be perceived as fragmented and implementation designs are being developed in silos. Wider industry collaboration will be crucial to address the longer-term challenge around interoperability to establish some form of “common ground”, establish stepping stones towards transacting with others and unlocking liquidity.

Establishing a viable use case with ability to deliver real value-add and address friction is key. Our focus is driven by the evolving needs of our customers and beyond digital bonds we consider tokenised deposits, digital repo and digital green bonds to be prominent use cases worthy of exploration to improve conventional capability.

* The tokenisation of assets, involving the digital representation of traditional assets on distributed ledgers or the issuance of traditional asset classes in tokenised form (OECD,2020) <https://www.oecd.org/finance/The-Tokenisation-of-Assets-and-Potential-Implications-for-Financial-Markets.pdf>”

Daniel Ahmed

Co-Founder and COO, Fasset

“Non-crypto-native businesses, in particular ones with a huge distribution network present an incredibly quick way for crypto adoption to increase. There is clear interest, and appetite for more non-crypto-native businesses to offer retail-focused crypto investment solutions, as seen with PayPal’s recent venture into creating their own USD backed stablecoin. Fasset is currently working with Indosat, one of the largest telco’s in the world to offer crypto investment solutions for their clients as a world’s first.

We see numerous opportunities and challenges when it comes to non-crypto-native businesses getting into crypto, these include:

Opportunities:

- **Diversification & Revenue Generation:**
Offering crypto investment options allows businesses to diversify their product offerings, potentially attracting new customers and retaining existing ones increasing revenue streams.
- **Innovation:**
Integrating cryptocurrencies can position businesses as innovators and pioneers in the financial technology sector, enhancing their brand and competitive edge.

Challenges:

- **Regulatory Uncertainty:**
The regulatory landscape for cryptocurrencies is still evolving, and businesses entering this space must navigate complex and potentially conflicting regulations across different industries.
- **Security Concerns:**
Dealing with cryptocurrencies involves robust security measures to prevent hacks, breaches, and theft, as the irreversible nature of blockchain transactions can lead to significant losses.”

Martin Bednall

CEO, Jacobi Asset Management

“Today, institutional clients and product providers encounter distinct requirements. Understanding assets like coins and tokens, their structure and behaviours, along with the processes to access them, is crucial. Addressing hack, legal, and technology threats is vital for effective risk management. Alongside education, the creation of safe tools for tokenizing traditional assets is pivotal.

Digital assets will become a multi-trillion-dollar market by 2030 with unparalleled diversification opportunities. Blockchain technology streamlines operations with speedily efficient post-trade settlement and clearing processes, blockchain-recorded electronic execution, and improved pre-trade information access. Soon, this enhanced efficiency will significantly benefit even the most illiquid assets.

ETFs are undeniably the entry point for widespread adoption, attracting investors who were previously hesitant thanks to the elimination of technical barriers and underlying asset risks. However, product providers face multiple challenges, including varying global regulations, slow-moving traditional institutions, and the need for increased liquidity. Overcoming these obstacles will revolutionise our aging traditional finance industry, addressing existing blockchain technology inefficiencies.

We believe Europe will be the next market to deliver this type of product for institutional investors, which has helped to legitimise Bitcoin as an investment asset, in turn signaling mainstream acceptance.”

Jeff Billingham

Director of Strategic Initiatives, Chainalysis

“From our vantage point, many financial institutions that focus on the institutional markets are using this period of economic and regulatory uncertainty to strengthen their in-house compliance expertise in anticipation of future adoption and demand for digital assets. This takes the form of education and training for their compliance leads, enhanced policies and procedures that accommodate the unique aspects of this industry, and access to tools that identify and prevent the illicit use of digital assets. This tends to be a multi-year effort, especially for businesses with a global footprint across several financial service segments. Once this groundwork is in place, we expect that financial institutions will likely see future success across four key opportunities: digital asset-business banking, digital asset-wealth management, exposure to the digital asset-spot or derivatives markets, or digital asset custody services.”

Nitin Gaur

Global Head of Digital Asset & Technology Design, State Street

“Digital asset technologies, such as asset tokenization and blockchain, are disruptive by nature and flatten business processing by shifting from asynchronous dissemination of information to more synchronous dissemination. This simple, technology-induced shift disrupts various elements of current market infrastructure providers, including access, global trading, process efficiency, regulation and compliance, and connectivity to markets. And the resulting data provides insights for business analysis and fuels RegTech.”

Emma Kerr

Senior Vice President & Head of Strategic Partnerships Europe, Visa

Visa, a leader in global payments, is a well-known player that has been active in exploring emerging digital asset opportunities in the payments space, having formed its crypto team in 2018. Among its initiatives, Visa has continued to work on updates to its settlement platform to enable settlement payments in USDC, most recently announcing the expansion of these stablecoin settlement capabilities to participating merchant acquirers.

“Crypto and digital currencies have the potential to shape the future of payments, and it’s as important as ever to understand what our clients and partners need in order to leverage new technologies to help improve the way money moves and financial services are delivered. Visa’s work in crypto started tangentially to our core business, and we advise the same to our clients. To begin by learning, building a team internally, and then moving closer to the core. It is still early, but we see huge potential in blockchain and other new technologies to facilitate faster and more efficient money movement for the benefit of Visa’s clients and end consumers.”

Sean Kiernan

CEO, Greengage

“Web3 represents a transformative shift in financial services, one that a digital merchant banking pioneer like Greengage eagerly embraces. At its core, Web3 revolves around decentralisation, empowering users with ownership of their data, assets, and interactions. This stands in contrast to the Web2 model in our industry, whereby the relevant banking / fintech platform typically controls the client experience within a walled garden of products and services. The shift to Web3 offers remarkable opportunities for us to redefine financial services by opening that up, and so enhancing client access to a wide range of products and services.

Greengage sees our role rather than being a traditional model of a financial services “tied agent”, providing only one’s own products and services, to being a facilitator of our clients accessing a decentralised financial ecosystem. This can include working with partnerships to deliver best-in-class products and services through a partnership platform, but also expands into providing access to novel digital instruments (we consider digital debt products to be a game changer in creating a new source of funding for SMEs, for example). We also see incredible efficiencies in the plumbing of financial settlement and trading, when underlying instruments are digitised we can then utilise properly the benefits of automated programmability through the use of smart contracts, leading to reduced costs and enhanced efficiency.

However, along with the potential come challenges. Regulatory ambiguity and compliance concerns loom large, demanding navigation through evolving legal landscapes and concerns particularly around AML concerns and potential hacking. Moreover, the lack of standards around DeFi and digital identity (a financial passport) frameworks mean some form of centralisation is still required as yet.

In seizing Web3 opportunities, we must pivot towards a hybrid model, leveraging decentralised technologies while upholding the trust from our dedicated client relationship managers, access to our client data, and expertise gained through our of “crypto friendly” e-money payment services today. This transition requires robust technical expertise, strategic partnerships, and a commitment to staying at the forefront of innovation in the decentralized financial space. By doing so, we can harness the potential of Web3, creating a more equitable and interconnected digital economy.”

Paula Kilgarriff

Web3 Brand Activation Consultant & Retail Innovation Lecturer

“In retail, we would say web3 is all about hyper-personalisation, co-creation and evolution. For example, I would log into the website, connect my wallet, and then the whole shopping experience would be hyper-personalised in real time. I then own my assets, and get incentivised for my data. It’s really about how brands are developing new communities and new protocols.”

Hirander Misra

Chairman & CEO, GMEX Group/ZERO13

“Tokenisation of ESG assets involves representing physical assets, such as renewable energy infrastructure or emission reduction projects, as digital tokens on a blockchain. These tokens can then be more easily traded and settled, making it easier for investors to access and diversify their portfolios in the renewable energy market to help meet ESG objectives.

One key challenge is lots of vertical silos in the carbon credits and ESG space, which hinders effective trading clearing and settlement. Additionally, regulatory frameworks and standardisation efforts need to be established to ensure interoperability and integration and collaboration between blockchain solutions and traditional stakeholders. Technology can act as an aggregator. One such example is what we are doing with our initiative ZERO13, which connects multiple international carbon exchanges, ESG markets, registries, custodians and ESG project owners globally for supply verification, transparent pricing and real-time settlement using APIs and across blockchains.

In conclusion, the application of blockchain in energy markets and the tokenisation of ESG assets offer exciting opportunities for increased efficiency, transparency, trust and sustainability. While challenges and overlaps exist, continued innovation, collaboration, and regulatory clarity will drive the adoption of blockchain technology in the energy sector, paving the way for a cleaner and more decentralised future.”

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“Asset tokenization will gain traction in financial markets as it can offer numerous benefits over and above analogue market infrastructure, such as:

Fractional ownership and enhanced distribution: Tokenisation can democratise investment opportunities by lowering barriers to entry. Investors can participate in previously inaccessible markets, such as real estate or venture capital, by purchasing fractional ownership through tokens.

More efficient post trade: Much of the asset servicing lifecycle can be automated with blockchain based smart contracts, including corporate actions such as dividend payments, shareholder voting, and compliance. Tokenization is attractive from a post-trade perspective because it reduces friction, increases settlement efficiency and reduces cost.

Some key challenges do remain, such as ensuring adequate investor protection. The regulatory environment related to asset tokenisation is still evolving. Different jurisdictions have varying regulations and requirements, including securities laws, KYC procedures, and AML regulations.

As asset tokenisation develops, interoperability between different blockchain platforms and traditional systems becomes crucial. One way to achieve this is an orchestration layer (such as that which we offer with GMEX Pyctor, acquired last year from ING) that allows interoperability between TradFi, DeFi and CeFi. An interoperable, Hybrid Finance (HyFi) model lends itself to tokenisation opportunities, increased distribution and increased revenues. It also supports experimental product and service development, and scalability, without significant associated investment.”

Jannah Patchay

Director, Markets Evolution and Executive Director / Policy Lead, Digital Pound Foundation

“There is nothing inherently radical about creating digital representations of traditional securities. Most would likely accept that it’s the next stage of their technological evolution. Looking beyond existing asset classes, though, things become a lot more interesting. Illiquid assets today tend to be illiquid due to their complex legal documentation, the high degree of due diligence involved, and the challenges of valuation. They can also reference a number of underlying assets, all of which must be included in any transfer of ownership, and all of which require valuation and risk assessment as well, culminating in significant, onerous paperwork to effect a transfer of ownership.

Tokenisation of these illiquid assets can lead to a host of benefits. It can enable more streamlined valuation of assets, as the assets themselves can carry valuation logic and links to valuation data sources. It can provide the ability to build in verifiable linkage to any underlying assets and to ensure that ownership of all of these is transferred successfully. The list also includes the ability for fractionalisation of tokenised assets, helping to create new liquidity and new investment opportunities, where these previously did not exist. This opens up previously inaccessible assets for asset managers and buy-side firms seeking alpha, while firms like banks can leverage the opportunities created to offload risk and to free up balance sheet capacity.”

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“Public, central bank-issued money (in the form of cash) currently represents the only fully accessible and inclusive form of money that we have. As physical cash use declines, the case for introducing a digital alternative to publicly-issued cash (whilst not necessarily supplanting cash in its entirety) grows ever stronger – as does the need for full clarity and transparency around the differences between the various new forms of digital money and their risk profiles.

We are likely to see a future in which multiple different forms of money – both public and private, and both those currently in use as well as new forms of digital money – coexist. Each has the potential to fill a different niche in the ecosystem and to provide enhanced consumer and business choices, arising from their different characteristics, the technical functionality that they offer, the nature of their issuers and their risk profiles (both real and perceived). For a truly diverse, competitive and effective ecosystem for new forms of digital money to become a reality, seamless interoperability, convertibility, and – above all else – preservation of the singleness of a given fiat currency in all its varied formats, will be required. Just as bank deposits can today be converted into cash, or e-money into bank deposits, the future evolution of money and payments will require equally seamless, trusted and invisible conversion between cash, bank deposits, e-money and new forms of public and private digital money.”

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“There are a number of barriers to the mobilisation of finance for sustainable outcomes. A lack of standardised ESG disclosure mechanisms – in a form that can readily feed into investment decision making – leads to information asymmetries in the market, creates opportunities for “greenwashing” and poses difficulties for investors in terms of the ability to fully risk assess and price potential investments. Combined this contributes to illiquid markets that lack transparency in both pricing and investment outcomes.

Performance of sustainable, green and impact investments is therefore notoriously difficult to measure and report with any degree of consistency, accuracy and reliability. This is where programmable digital assets can really add value that goes beyond financial measures. Indeed, given the complexities of measuring and integrating ESG metrics into instrument pricing, digital assets may be the only solution to the challenges of transitioning to a more sustainable financial system.

A digital green bond, for example, can be linked directly to an array of sensors and project management tools that automatically update it with metrics on a real-time basis. This real-time data can then be assessed by the smart contract governing the digital green bond, against predetermined performance criteria, and divergences whether positive or negative automatically reported to investors holding the asset.

With these capabilities, issuers can also structure financing instruments that incentivise better performance against ESG objectives, for example by automatically paying out to investors when certain targets are met or enabling investors to better manage ESG risk exposures by compensating them when performance thresholds are not met.”

Tony Petrov

Chief Legal Officer, Sumsud

“Blockchain is usually mistakenly considered to mean only cryptocurrencies working based on decentralized ledger technologies, and cryptocurrencies still have a very limited acceptance level among traditional banks, especially in Europe. In the US, the recent bankruptcies of three major crypto-oriented banks are also making this matter highly risky. It must be noted that this attitude of traditional financial institutions towards crypto is reasonable, as they are first and foremost the agents of fiat issuers and therefore would normally hate fiat’s potential competitors. However, blockchain is not only cryptocurrencies, and the distributed ledger technologies go far beyond crypto. For example, you can use blockchain to record transactions in a ledger, and once entered, the record is virtually impossible to erase. At the same time, the whole philosophy of blockchain is centered around automated procedures not requiring human involvement. Therefore, blockchain-based infrastructures are: more secure, more fast, more cheap, less prone to making mistakes and, at the end of the day, more immediate way of processing transactions. These good sides will be for sure appropriated by the traditional banks. It would hardly be an overstatement to say that most struggles eventually end up with mergers. Fiat systems will appropriate blockchain just like that.”

Julian Sawyer

CEO, Zodia Custody by Standard Chartered, SBI and Northern Trust

“Institutional investors are actively seeking a reliable, secure, and compliant partner to participate in the dynamic DeFi ecosystem. Zodia Custody stands out as the natural partner for institutions aiming to capitalize on the potential that arises from participation in the digital asset space. Being bank-backed and institution-first, we make access to this potential free from compromise. At Zodia, we facilitate and streamline DeFi participation through our extensive, seamless partnerships that enable our clients to earn potential yield:

1. Zodia Staking

Our staking integrations with multiple providers ensures a fully automated and streamlined service that allow our clients to earn a potential yield in exchange for participating in blockchain network security activities.

2. Yield (coming soon)

Our integration with multiple registered financial entities allows our clients the potential to earn yield on tokenized T-bills and other real-world assets, whilst their assets are held in custody.”

Dr Jane Thomason

Author, web3 and metaverse thought leader

“Green digital asset solutions, carbon markets, decentralized energy trading, smart grid management, NFTs, DAOs, incentivization and transparent measurement and reporting are all ways Blockchain and Web3 can be deployed for climate action. Metaverse and immersive reality will enable the use of Digital Twins across energy, water, and telecoms networks to enable the examination of climate projections and impacts. Digital twins and augmented reality can simulate natural disasters through real-time interaction and accurate 3D registration of virtual and real objects. It is early days for Metaverse, but the value of digital twins and virtual experiences are also expected to be deployed for climate action. Collaboration will continue to be crucial in developing and adapting Web3, Blockchain, Metaverse and other technology-based solutions that support climate actions, bringing together the global community to scale climate action. A key element to scaling will be mobilizing capital through sustainable finance initiatives for climate action through green digital asset solutions, green bonds, fintech solutions, and alternative finance mechanisms.”

Mark Williamson

Managing Director, HSBC

“We’re seeing these different versions of the metaverse evolving: industrial, supply chain and consumer. And so tying those three different aspects together, looking at a luxury handbag, for example. You can see that, in the factory, the materials have been sustainably sourced and how the product is being made. Then it goes into the supply chain metaverse: it’s being tracked and again you have embedded systems for FX, payments, financing and decarbonising the supply chain. And finally for the consumer, you can see from your wearable device that the product has come in stock, and there’ll be a digital wallet, ID system and connectivity into blockchain ecosystems to make your payment. And you’ll be able to get the NFT that proves you bought an authentic luxury handbag. So we’re seeing those sorts of examples coming through as real world use cases.”

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“We’ve got to solve for this CBDC Rubik’s cube. And so what I mean by that is wholesale, retail; token-based, account-based; domestic and cross border. On that, the other challenge we need to think about is from a primary market, secondary market and foreign exchange and securities services aspects.”

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“If you’re able to get better visibility, transparency and workflow of cash moving through the system, then you’re able to release a lot of trapped liquidity in the marketplace. Part of the challenge around traditional markets is that a lot of the assets are trapped in inefficient settlement layers. So having a settlement layer that’s able to sort that out is important.”

Sendi Young

UK & Europe Managing Director, Ripple

“It’s clear that innovations with digital payment assets are continuing to grow, and blockchain-based payment models are increasingly interacting with the broader financial system to solve real-world problems.

We’re seeing more businesses using blockchain as a bridge to move money across borders to enable cheaper, more reliable and on demand transactions. For corporate treasurers, for instance, who are managing substantial pools of liquidity across multiple markets, the visibility and control that these payment rails provide is crucial.

Digital assets like CBDCs, stablecoins, and cryptocurrencies play a significant role in transforming the payments system. With their ability to increase the speed and efficiency of payments, and reduce costs, there is a growing appetite to roll out these projects. The Bank of England and HMT are considering plans for a digital pound, while other jurisdictions like the Republic of Palau and Colombia’s Central Bank, are piloting use-cases leveraging Ripple’s CBDC platform to drive innovation and open up new opportunities for exchanging value.

Anticipation for tokenised real-world assets is also growing and we are already seeing this interact with CBDC infrastructure. For example, as part of its e-HKD pilot programme, Hong Kong Monetary Authority has chosen Ripple and its partners including Fubon Bank to showcase a real estate asset tokenisation use case.

Financial institutions and central banks are pursuing real-world initiatives changing the status quo with existing payment rails and helping increase financial inclusion. The desire for transformation needs to be balanced with the need to maintain stability on a global scale. Ultimately, success will depend upon adoption and education as well as global regulations.”

Tom Zschach

Chief Innovation Officer, Swift

“Tokenisation has been identified by the capital markets industry as having the potential to increase efficiency, reduce costs, and open up investment markets to more people by enabling fragmented ownership. But, with different blockchains - all requiring different functionality and having different liquidity profiles - there’s a clear need for interoperability to give financial institutions one single point of connectivity.

Interoperability is at the heart of Swift’s strategy. We’re focused on ensuring that the new financial ecosystem is inclusive, and facilitating the seamless flow of all types of value across borders. This is all the more important in an increasingly fragmented world. Our collaborative experiments have already shown the role that Swift can play in facilitating the flow of tokenised value, and we’re excited to work with our community to enable them to connect seamlessly to multiple blockchains to support growing investor demand for digitally native and tokenised assets.”

About Zumo

Zumo is a B2B digital assets infrastructure engineered with a focus on compliance and sustainability. It enables financial institutions and enterprises to effortlessly embed digital assets via a simple API, unlocking the potential of their brand in web3 and meeting the demands of connected customers.

Zumo's turnkey digital-assets-as-a-service platform offers a fast, flexible and low-barrier route to market, empowering fintechs, banks, asset managers and brands to offer their consumers the tools of the future simply and securely while also opening up new revenue streams, attracting new customers and supporting customer retention.

Available via API/SDK, Zumo's white-label solution gives businesses a blockchain-agnostic suite of tools through which to enable customers to securely hold, buy, sell and send digital currencies, complete with wallets, exchange service and facilitated onboarding & compliance.

For further information, please visit zumo.tech