

Intended for Institutional Clients Only

# INDUSTRY REVOLUTION VOLUME IV - THE CONVERGENCE OF THE CRYPTO AND TRADITIONAL ECONOMIES: HOW INVESTMENT MANAGERS CAN DELIVER VALUE IN A DECENTRALIZED "NewFi" WORLD

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# Methodology

For Volume IV of our Industry Revolution Series, Citi Business Advisory Services conducted 95 in-depth interviews with firms that collectively managed \$39.6 trillion of AUM, or 47% of total professionally managed assets.<sup>1</sup>

Investment managers comprised 40% of our interviews and represented more than \$35 trillion of AUM. These included a variety of traditional asset managers, hedge funds, and private equity firms. A further 10% of interviews were with asset owners and intermediaries representing approximately \$4.5 trillion in assets. Participants included pension funds, sovereign wealth funds, and wealth managers. Among this investment management community, we targeted individuals leading innovation efforts, including CEOs, COOs, CIOs, Heads of Innovation, and other related investment professionals.

Moving beyond the investment management ecosystem, a third of our interviews (35%) were with Fintech subject-matter experts, and pioneers within the crypto and emerging decentralized finance ecosystem. These included a mix of crypto asset managers, decentralized exchanges, lending and trading platforms, custodians, as well as a few retail investors. Our interviews also targeted the broader stakeholder universe, such as lawyers, consultants, and sell-side experts to discuss the developments and range of services in the emerging digital economy.

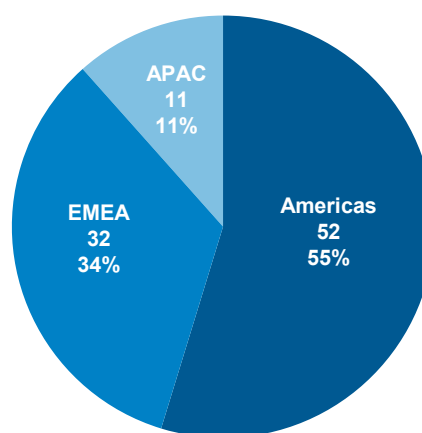
The 95 in-depth interviews included views from over 100 individuals. The geographic breadth and broad spectrum of firms that participated, helped to generate a unique viewpoint into the innovation taking place. The geographic split of interviews (55% Americas; 34% EMEA; 11% APAC) was designed to reflect global AUM.

Each interview—which lasted an average of 45 minutes—was an open-ended discussion on how the emerging trends in the crypto economy, and the broader innovation already taking place, could transform and create new opportunities for the investment management industry. As in previous reports, we have included a wide selection of anonymized quotes throughout the report, to give a flavor of the insights shared by interviewees.

An overview of the geographic and participant breakdowns is provided in the following charts:

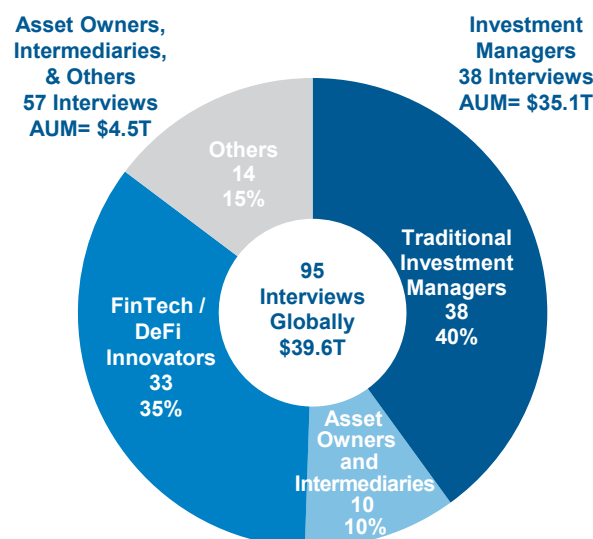
We are delighted to share the findings of our 4<sup>th</sup> Industry Revolution report. We would like to express

## Geographic Breakdown of 95 Interviews



Source: Citi Business Advisory Services

## Breakdown of Interviews by Firm Type



Source: Citi Business Advisory Services; AUM from Company Websites

our gratitude to all those individuals who participated in our survey and were so generous with their time. Thank you. We hope you find this a useful guide to quantifying the potential opportunities for your firms.

<sup>1</sup> Citi Business Advisory Services' analysis based on data from Broadridge Global Markets Intelligence, as of Q4 2020.

## Key Findings

Architects of the crypto domain, together with a growing number of retail—and increasingly institutional—participants are pushing the boundaries of how financial markets work. They are running real-time proofs of concept every day in an ecosystem that just surpassed \$2.0 trillion in total investment interest as of April 2021—a figure that more than doubled in the first months of 2021 alone.<sup>1</sup>

Against this backdrop of growth, our Industry Revolution report looks out 5+ years to speculate on how the developments captured in today's headlines may evolve and what aspects may migrate into the broader financial ecosystem. While it is easy to dismiss crypto and its adjacencies as overhyped, and a relatively small share of the industry—to do so would be a mistake.

This ecosystem is being designed by some of the top development talent in the world and is being delivered on a new Web 3.0 technology. Just as cloud-based infrastructures, with their accompanying big data and the AI toolkit, were initially associated with the social media giants before migrating into the broader economy and displacing mainframes and servers, these new technologies and the models they enable may have an equally disruptive potential.

Moreover, much of the experimentation taking place in the crypto domain is focused on designing a new approach to financial interactions and participation. The developers leading these efforts originate outside the industry. They are not bound by regulatory limits or steeped in industry thinking. New models and approaches are emerging. Transformations may go beyond the financial realm, rippling across the economy as a whole.

Looking at the crypto domain as a petri dish of innovation and thinking about what might emerge allows us to think about the potential models, threats, and opportunities that may occur on the path to convergence between the traditional (TradFi) and decentralized (DeFi) financial worlds. Our goal is to envision a resulting New Financial (NewFi) space and explore how investment managers may be challenged and able to compete in that potential landscape.

### Section I: The Emergence of Financial Populism and Its Implications for Investment Managers

The advent of first, digital, and now crypto investment options, are offering individuals new pathways to obtain knowledge, insights, advice, and alternative access points that enable them to lever their small dollars, online presence, and community affiliations to pursue their own investing strategies. A significant shift is underway that is helping change the industry's understanding of this segment's investment power. Rather than a "smart" versus "dumb" money formulation that has long characterized the industry's view about the difference between institutional and retail participants, a new "professional" versus "crowd" money dynamic is emerging.

#### *COVID-19 Accelerates Risk-Taking & Emergence of Financial Populism*

A number of drivers are shaping this trend, evidenced by an emerging sense of financial populism that is seizing the market today. A growing share of retail participants perceive regulations as creating an uneven playing field that is helping to create a financial "elite" with more access to investment strategies and more opportunities to utilize their assets in ways designed to increase their returns. This is exacerbating longstanding concerns about wealth inequality and individuals' ability to achieve retirement readiness and general financial stability.

COVID-19 proved to be an accelerant to this trend. Not only did individuals begin to spend more time online because of lockdowns, many also benefitted from government subsidies and increased savings that helped to expand their pool of investible capital. Risk-taking from individuals, long a characteristic of Asian retail investors, began to rise across the globe.

Engagement in the digital realm skyrocketed. Individuals increased their participation in newly regulated peer-to-peer and crowdfunding platforms to improve their diversification, with those marketplaces reaching new highs. More importantly, digitally savvy individuals began to pool their small dollar buying power and share insights and strategies with like-minded peers to significantly expand their participation in TradFi equity markets, sometimes to ill effect such as with what occurred with Game Stop and the other meme-stocks earlier in 2021.

<sup>1</sup> "Crypto Market Cap Surpasses \$2 Trillion After Doubling This Year", Olga Kharif, Bloomberg, April 5, 2021  
<https://www.bloomberg.com/news/articles/2021-04-05/crypto-market-cap-doubles-past-2-trillion-after-two-month-surge>

Experimental risk taking also began to migrate to the crypto ecosystem as more retail participants sought returns and took advantage of opportunities not allowed them in the current market and status quo.

### **Crypto Domain Offers Retail Investors a Blank Slate to Rewrite the Rules**

Individuals are afforded far more freedom to access opportunities, leverage their assets more effectively, and build portfolios without gatekeepers to limit their activities in the crypto domain.

This is resulting in the emergence of a new category of investors that we have dubbed “Fin-dividuals”. These investors look at the potential of each asset they hold in their portfolio and determine the most effective use of that asset to amplify their returns or yield. In this way, they operate with much the same mindset as an institutional investor, although in a more limited and unregulated opportunity pool.

While investment managers race to improve their solutions practices in order to offer wealth clients a more tailored experience, the set of assets that they are looking to optimize may represent a shrinking portion of many individuals’ portfolios as “fin-dividuals” holdings expand to include P2P loans, crowdfunded investments, cryptocurrencies, and NFTs.

If traditional investment managers cannot service those portions of the portfolio, new entrants may gain footholds. This is one of several potential risks facing the investment management industry and the broader TradFi ecosystem.

Not only is crypto ecosystem being driven by retail participants that are able to access and utilize their assets in ways that are not permissible in the traditional financial world, the community-based development approach in these projects, which prioritizes innovation and self-disruption, ties financial incentives to code, and rewards participants with a stake in the ecosystem’s growth, may draw talent and investors away from the TradFi industry.

### **Section II: The Crypto Domain as the Petri Dish of Innovation**

The emergence of “fin-dividuals” as a new investing persona validates the efforts and marks an achievement of the goals set out by the developers that helped to create the crypto ecosystem. Offering *anyone* an opportunity to engage in financial transactions and empowering them to perform tasks that had previously only been available to select participants and performed by trusted intermediaries is the foundational principal of the crypto “ethos”.

### **Crypto Experiment is About Much More than Bitcoin**

Enabling this type of environment required solutions to technological and cultural issues that had never been attempted at this scale. Creating a global, decentralized, peer-to-peer network that can operate in a “trustless” environment is a monumental achievement regardless of whether one believes that the assets being traded or the models being pursued in this space merit serious consideration.

Not only is the crypto domain creating a new system, it is simultaneously operationalizing it. The code that is testing out new concepts and the blockchains that are working to accurately track and verify transactions are running 24/7/365. Never has a proof of concept occurred at such scale.

While Bitcoin and stablecoins are the most recognizable innovations in the crypto domain, the decentralized applications (Dapps) being created on development platforms like the Ethereum network are where the most cross-over potential with TradFi exists. Many of these Dapps in the financial realm offer an entirely new way of performing financial activities that creates a network effect and mutualizes the benefit of system growth to all participants. Many are becoming “proto-companies” by putting in decentralized governance and enabling a completely unique engagement model that allows a participant to simultaneously be a user, owner, and manager of the underlying protocol.

The technology these proto-companies are being built upon is also transformative. Smart contracts enable Dapps to define terms and conditions to automatically manage transactions, without the need for any oversight and are able to embed ownership and utilization rights into the asset itself for new non-fungible tokens (NFTs). Decentralized oracle networks identify the real-world inputs needed to trigger actions in the smart contract code, obtain and deliver that information directly to the smart contract via APIs. Every Dapp is built on the same code base and uses the same smart contract templates, enabling complete interoperability across Dapps and allowing them to be composed in a manner that allows them to link their services together like Lego building blocks.

The creation of these protocols together with the composability of the functions and the fact that they can operate without human intervention is creating a whole new ecosystem. Collectively, this emerging investment space is known as Decentralized Finance (DeFi).

Two broad categories of DeFi models have emerged with direct applicability and relevance in the financial industry: those that reflect new ways of *trading assets* (such as automated market making, yield farming, etc.), and those concerned with new ways of *creating assets*, the most commonly known today being Non Fungible

Tokens (NFTs). This extensive catalogue of new technologies, coupled with a cultural overlay of decentralized collaboration and cooperation is leading to a sea change in how, where, and why innovation occurs.

### Section III: Crypto Experimentation Offers Glimpses of NewFi, Enhanced Creator Economy

While financial industry participants may observe developments in the crypto domain as an interesting source of innovation and experimentation, there is a sense that these models pose little threat to the broader investment world.

Yet, there are known problems in the existing investment landscape that have no easy answers. Foremost among these concerns being a clear migration in company value from tangible to intangible assets with approximately 90% of the S&P 500 market capitalization now considered to originate from these intangible sources (IP, customer lists, brand equity, etc).<sup>2</sup>

Today's approach to measuring intangible asset value falls short. In addition, there are a growing number of intangible assets that are *purely digital* and the frameworks for evaluating the economic impact of those variables are either overly simplistic or missing entirely.

Societal aspects of how the new economy is unfolding are also a concern. We are in the midst of a burgeoning creator economy. Many of the digital assets and interactions driving value and creating the data to feed the development of algorithms and network growth originate from individuals. The balance of economic power between these individuals and the companies reaping the benefit of their energies is skewed, however, with little direct income accruing to those that are driving engagement.

#### **DeFi and NFTs May Offer New Solutions to Persistent Problems**

Developments in the crypto realm, particularly the DeFi and NFT models being experimented with at present, may offer templates and lessons to unlock the value of intangible digital assets and help to re-balance the allocation of economic value between individuals and companies in ways that could be beneficial to both. Application of these models may create version 2.0 of the creator economy and lead to the emergence of a completely new financial ecosystem which we dub "NewFi".

NewFi dynamics provide a mechanism to value assets that create and benefit from network effects, be that Dapps, protocols, digital files or proprietary IP. While consumers and companies today recognize the impact

of things going "viral", they cannot engineer it to happen and there is only rudimentary attempts to attach monetary value to the phenomenon. Both activities might soon be enabled and rendered measurable by adoption of key tenants from the DeFi approach and by NFTs.

Although templates built on these models might help extract the value latent in the digital sphere, a significant amount of value would remain locked up and stranded in the physical realm.

Our original Industry Revolution report published in 2018 previewed the blueprint that is enabling today's tokenization of digital assets and hypothesized that this would offer a way to open up the world of physical assets to a broader set of investors. Not only do we continue to see that as a viable path forward, the democratization of the "create" process enabled by NFT platforms and the growing savvy of "fin-dividuals" may open up the entire world of assets—both digital and physical in coming years. This may change consumer behavior and investor expectations in a transformational way, much as the emergence of the "sharing" economy did in prior years.

As tokenization unlocks latent sources of economic value in new types of digital, and perhaps soon physical assets, and as DeFi protocols improve and become more tested and cost effective, the opportunity for investors to both create their own assets and initiate their own financial activities may grow and extend from niche crypto players to a more robust and professional ecosystem of individuals, companies, and institutions.

The main differences between this new financial ecosystem (NewFi) and the traditional financial ecosystem (TradFi) might be that the array of potential issuers is far larger, the types of assets that might be created as investible opportunities would be far more varied and the embedding of those transactions into an investor's day-to-day life may be far more integrated than today's financial marketplace.

### Section IV: Launch of CBDCs May Trigger Merging of TradFi and NewFi Realms & Redefine "Assets" and "Asset Management"

Any merging of the TradFi and NewFi world may take time. A complex set of pipes, plumbing, and processes are successfully processing billions of dollars' worth of transactions everyday in the TradFi domain across a complex web of counterparties and service providers. Layers of regulation are intricately woven into the entire ecosystem. There has thus been little appetite to begin any wholesale redesign of this system which works and is operating effectively, even if redesign offers the prospect of greater efficiency and better accuracy.

<sup>2</sup> "As Intangible Assets Grow, So Does The Role Of ESG Standards", Martin Jarzebowski, Forbes, December 29, 2020, <https://www.forbes.com/sites/forbesfinancecouncil/2021/12/29/as-intangible-assets-grow-so-does-the-role-of-esg-standards/?sh=3894476e4d44>

This NewFi ecosystem is still in its infancy with Bitcoin having been in existence for just over a decade, and Ethereum and many of the newer platforms and protocols driving innovation having launched in just the past 5 or 6 years. There are still key pieces of the crypto experiment that do not work at scale, and elements are still missing that would be required to facilitate broad participation.

As a result, the split between these two *investment* domains is likely to persist for some time. The same however cannot be said of the *payments* space.

### **Central Bank Digital Currencies May Spur Wholesale Redesign of TradFi World**

The clash between traditional and emerging payment approaches is already creating direct competition and influencing the pace of innovation across established participants. Some of this innovation is coming from commercial enterprises, but the initiatives with the most transformative potential are coming from the global set of central banks. When such institutions begin to contemplate and create new operating models, the effects are likely to be felt across the global economy and with transformative implications.

For the investment management industry, the launch of central bank digital currencies (CBDCs) may prove to be the trigger that ends the current system's period of inertia and spurs a wholesale re-design of the processing, settlement, and management of securities. Several initiatives to enable the relocation of both payments and securities processing to blockchains are already in flight, sponsored by leading central banks, regulators, and central security depositories. If these efforts take hold, it may be only a matter of time before securities become tokenized as well.

### **Assets and Asset Management Take on New Meaning in a Consolidated Digital Wallet**

If this happens, the differences that currently prevent interoperability between the TradFi and NewFi domains may fade and pathways to new capabilities be created. All of an investor's assets—securities, physical and digital—might be tokenized and thus considered holistically in designing and building investment strategies.

The investor's "portfolio" would become this entire set of assets, creating the opportunity to not just manage their investments, but to optimize everything that the individual or institution "owns" and all of the operating and investment cash that they possess. Rather than just investing a customer's assets, investment managers in the future may be thinking equally about how to help their client create assets, access specialized marketplaces, earn passive income from contributing or sharing resources, and optimize the utilization of each asset in their consolidated set of holdings to generate additional yield.

Having such breadth would transform the role of "asset" manager and further blur the lines between investment management, wealth management, and banking, changing asset managements' value proposition as well as the scope and structure of the competitive landscape.

### **Section V: Asset Management in the New World**

The weight of the extraordinary technological, market, and economic changes addressed in preceding sections suggest that investment managers are unlikely to remain competitive by doing what they have successfully done in the past. At a firm level, the applications of these new technologies opens up previously impossible pathways of monetization, and a potential transformation in the value that asset managers may be positioned to deliver to investors.

### **Turning Unique IP into Protocols and Dapps and Rethinking How Transactions Occur**

In a sense, investment managers have already begun on the path toward process decomposition by trying to bring a more scientific discipline to the investment and solution design process. Today's initiatives focus on process optimization at the task level in order to determine the right balance of man versus machine. Evolving the algorithms being developed today to perform key tasks and re-architecting them to be crypto-style protocols could transform the way that firms operate.

Managers may use these protocols to insource processes that are undifferentiated and monetize their unique IP by externalizing it as a Dapp, taking advantage of the ability to share the service while maintaining the proprietary code. This may allow a wider range of investment managers to participate in value creation and blunt some of the benefit that having a broad investment and solution platform provides the largest firms in today's landscape.

Success in the future may coalesce around those firms that are early to market and able to draw users into their community, thus creating their own network effect and benefit from "virality". New revenue models may emerge to both reward the provider and incentivize participants in such a system.

More "coopetition" may result. Banks, wealth managers, investment managers and other types of participants may need to work together to understand and service the range of assets held in an investor's digital wallet. This may result in new types of governance arrangements that incentivize cooperation and allow service partners to have a voice in influencing each other's development plans.

Brand may become an increasingly important element of the competitive strategy, irrespective of a manager's role, specialism, or size as trust takes on increased importance in a trustless decentralized ecosystem.



## ***Planning Ahead***

Our goal in providing this report is to help our clients understand and evaluate how shifting dynamics among individual investors, and the unprecedented wave of financial innovation occurring outside of the industry may pose significant threats to the status quo. Our reports typically look at how the majority of investment managers may need to adapt to changes being driven by market leaders. This report tries to highlight that the leaders themselves may now be coming from a completely different vector.

Experiments today occurring within the crypto domain may be much more of a disruptive threat to the industry than anyone today may realize or appreciate. We hope that by opening a dialog about why that may be the case and discussing how investment managers might respond, we can help our clients navigate the coming period of change in a manner that allows them to adapt and thrive by anticipating and planning ahead. We look forward to your questions, comments, and engagement on this report and stand by for future discussions.

# Section I: The Emergence of Financial Populism and Its Implications for Investment Managers

The advent of first, digital, and now crypto investment options, are offering individuals new pathways to obtain knowledge, insights, advice, and new access points that enable them to lever their small dollars, online presence, and community affiliations to pursue their own investing strategies.

A shift is underway that is helping change the industry's understanding of this segment's investment power. Rather than a "smart" versus "dumb" money formulation that has long characterized the difference between institutional and retail participants, a new "professional" versus "crowd" money dynamic is emerging.

COVID-19 proved to be an accelerant to this trend. Not only did individuals begin to spend more time online because of lockdowns, many also benefitted from government subsidies and increased savings that helped to expand their pool of investible capital. Risk-taking from individuals, long a characteristic of Asian retail investors, began to rise across the globe.

This phenomenon has several important implications for the investment management industry.

A growing share of retail participants perceive regulations as creating an uneven playing field that is helping to create a financial "elite" with more access to investment strategies and more opportunities to utilize their assets in ways designed to increase their returns. This is feeding concerns about wealth inequality.

More retail participants are looking to alternative marketplaces to find returns. This is splitting the pool of wealth available for investment managers to oversee. Many firms are working on initiatives to tailor and optimize individual portfolios of equities and bonds, but such holdings are now only a portion of many investor portfolios that are starting to include P2P loans, crowd-funded investments, cryptocurrencies, and NFTs.

The crypto domain in particular is emerging as a threat. Not only is the ecosystem being driven by retail participants that are able to access and utilize their assets in ways that are not permissible in the traditional financial (TradFi) world, the community-based development approach in these projects, which prioritizes innovation and self-disruption, ties financial incentives to code, and rewards participants with a stake in the ecosystem's growth, may draw talent and investors away from the TradFi industry.

With the TradFi world being constricted in their thinking by what is *allowed* when a growing community of crypto developers and participants are driven by what is *possible*, a change in industry dynamics may be beginning.

## Unequal Investment Playing Field Creates Concerns about Wealth Inequality

Despite efforts from investment managers to accommodate a variety of investor types, institutional and individual investors have significantly different opportunities, access, and service experiences in the current investment management landscape. Rules meant to protect individual investors are increasingly being seen as barriers, benefitting those individuals with greater amounts of net worth and working against those with less wealth.

Perceptions that the playing field is unequal are being borne out by meaningful differences in investment performance as the vast majority of individuals are curtailed from investing in private and alternative investment opportunities—the source of outsized returns and the focus of institutional flows for the last several years.

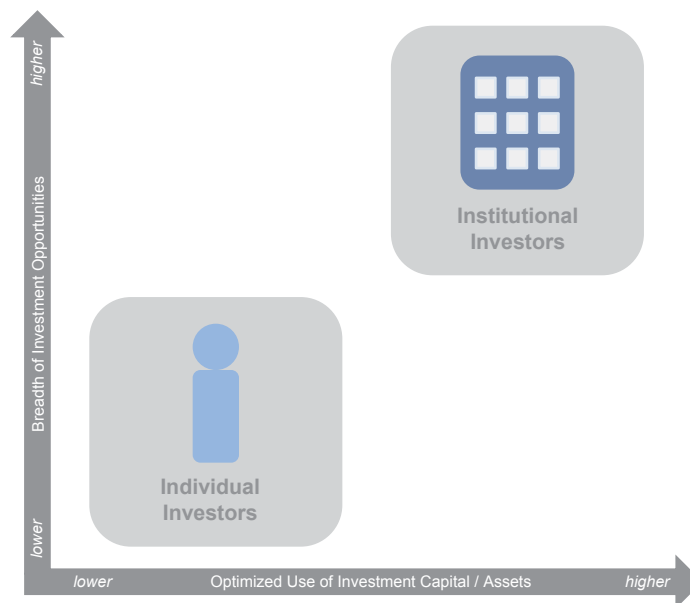
As a result, the accessibility of investment opportunities is becoming a growing point of concern and part of a broader narrative regarding wealth inequality. Such worries are coming at a time when the majority of individuals do not feel prepared for retirement and many are concerned that government pensions may not be able to cover their future requirements.

## Comparison of Institutional vs. Individual Investment Opportunities

Because of regulatory restrictions and differences in the size of their relative investment portfolios, investment managers today provide institutional investors access to a broader range of investment opportunities and utilize their assets in a more effective manner than the corresponding delivery of product and services to individual investors. This discrepancy is highlighted in Chart 1.1.

The split in approach between individuals and institutions is showing up in many aspects of investing. Although investor types may have a wide array of needs

Chart 1.1: Delivery of Investment Management to Various Investor Types



Source: Citi Business Advisory Services

at a micro level, in aggregate, both individual and institutional investors share a common, broad set of requirements for their investment products and services. These needs can be best expressed across six dimensions:

- **Wealth Creation:** Building and compounding capital over time through appreciation in the value of assets or the returns made from investing and/or leveraging their investments in various asset classes (e.g., stocks, bonds, private equity).
- **Access:** Opportunities to select from a wide range of strategies and a broad set of products or services to formulate a portfolio as well as the ability to utilize more sophisticated techniques to protect or amplify the impact of investment dollars.
- **Knowledge:** Understanding of how to assess investment opportunities and evaluate the potential risks and rewards of different strategies, techniques, or investment ideas.
- **Alignment:** Confidence that the investment portfolio is fit to purpose in that it takes into consideration the investor's specific needs, goals, and risk tolerance and that it is designed to deliver in their desired time horizon.
- **Advice:** Guidance, intelligence, and ideas on how to best maximize returns and reduce risk around capital accumulation as well as meet end-investor goals.
- **Community:** Participating with and benefiting from the best practices and insights obtained through dialog with like-minded investors.

As illustrated in Chart 1.2, today's investment management industry is largely positioned to meet institutional investors' needs across these parameters, but not those of individual investors. When measured side by side, the differential in coverage is stark.

Redressing this imbalance, unfortunately, is not really in the hands of the investment industry. Managers have been pushed into this position of acting as a "gatekeeper" with regards to individual investors because of regulators efforts to ensure protections for this group. Restrictions on the suitability of certain types of investments and investment techniques limit the industry's options. Investment managers are forced to design products and services for individuals based on what is *allowed*, not necessarily on what is *desired*.

#### **Investor Protections Can Often Be Seen as Investor Barriers for Lower Wealth Individuals**

Individual investors are both barred from many types of investment opportunities because of the size of their investible assets and deterred from participating in certain investment techniques such as the use of derivatives, financing, and borrowing and lending because of their perceived lack of understanding about the associated risks. Simply put, regulators do not view a wide variety of investment offerings as "suitable" for individual investors.

As an example, in the United States, the largest private equity market in the world, 98% of the population is restricted from investing directly in private equity funds.<sup>1</sup> These restrictions have been put into place regardless of the fact that the U.S. is also home to the largest pool of

1 "Finally, A Road Map For Opening Up Private Equity To Retail Investors", Antoine Drean, Forbes, October 15, 2020, <https://www.forbes.com/sites/antoinedrean/2020/10/15/finally-a-road-map-for-opening-up-private-equity-to-retail-investors/?sh=5938a7501278rt>

retail investors globally. Limitations on what these retail individuals can invest in extend to all private funds including hedge funds, private debt, real estate funds, infrastructure funds, and natural resource funds.

This split in the opportunity pool afforded to individuals has been especially difficult in recent years. While 100% of retail investor flows moved between cash, active security funds, and passive security offerings, \$6.9 trillion of institutional flows were directed away from these markets to alternatives between 2015 and 2020.<sup>2</sup>

Based on the current accredited investor rules, to invest directly in a private fund, investors must have at least \$1 million in assets, excluding their primary home, or \$200,000 in annual income. To invest in private funds that have more than 100 investors, which encompasses the vast majority of private offerings, investors need \$5 million or more in investments.<sup>3</sup> Similar restrictions on investing in private funds exist in most countries.

These types of restrictions are splitting the individual investment audience. Those with higher amounts of wealth are being afforded a broader set of opportunities than lower net worth individuals who are being excluded from such funds. Ultra-high net worth and high net worth individuals, as well as the family offices created by these participants, are emerging as a third category of investor – the “insti-vidual” – individuals

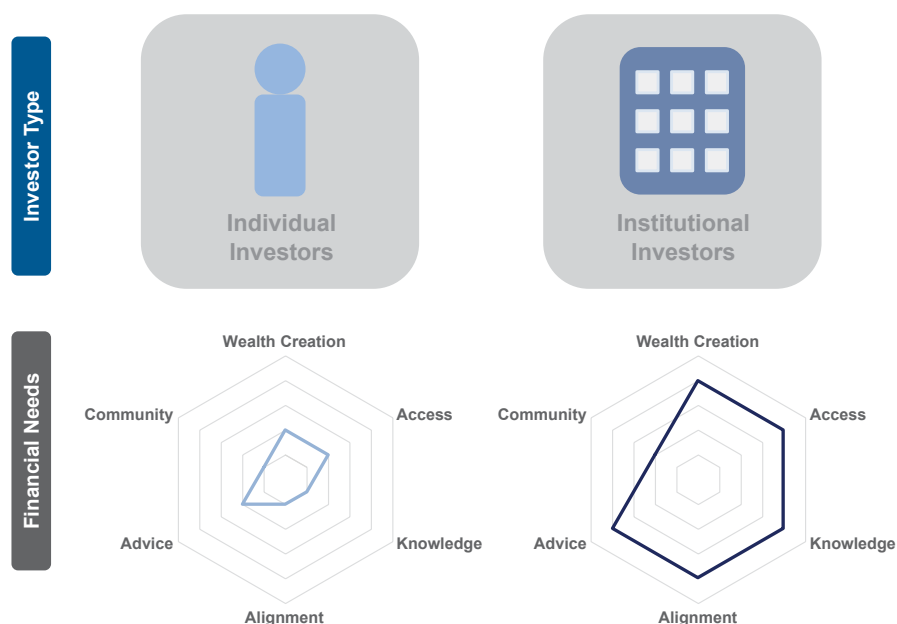
being given institutional levels of access. This is shown in Chart 1.3.

These investors are afforded more opportunities for wealth creation, offered more insights and advice from investment fund managers looking to attract capital, and as a result of those two considerations, are able to obtain portfolios that are better aligned to their goals and objectives. While the majority of these individuals are still not able to utilize many of the techniques employed by institutions to optimize their use of capital and assets (e.g., borrowing and lending securities, derivatives), they nonetheless are afforded a much more well-rounded investment experience than the majority of individuals as shown in Chart 1.4.

The number of investors able to qualify for the insti-vidual category are quite limited. In the U.S., there were 245 million adults in 2019, but only 7.6% of those individuals would have met the \$1.0 million or more net worth requirement. In Europe, there were 589 million adults, but only 2.3% would have reached this threshold and in China, there were 1.1 billion adults of which only 0.4% were listed as having \$1.0 million or more in wealth.<sup>4</sup>

Limiting individual investors from participation in private markets is resulting in a significant opportunity gap. A U.S. Private Equity Index provided by Cambridge Associates shows that private equity produced average annual returns of 10.48% over the 20-year period ending on June 30, 2020. During that same

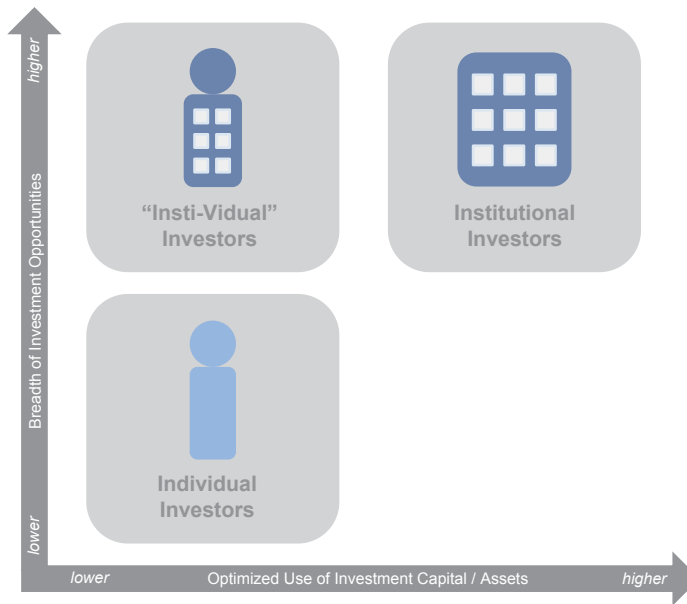
**Chart 1.2: Investment Management’s Ability to Meet Investors’ Perceived Needs**



Source: Citi Business Advisory Services

2 Citi Business Advisory Services’ analysis based on data from Broadridge Global Markets Intelligence and Hedge Fund Research  
 3 ibid  
 4 “Credit Suisse Global Wealth Report 2020”, Credit Suisse, October 2020, <https://www.credit-suisse.com/media/assets/corporate/docs/about-us/research/publications/global-wealth-report-2020-en.pdf>  
 5 “How Do Returns on Private Equity Compare to Other Investment Returns?”, Mark Jahn, Investopedia, January 5, 2021, <https://www.investopedia.com/ask/answers/040615/how-do-returns-private-equity-investments-compare-returns-other-types-investments.asp>

Chart 1.3: Delivery of Investment Management to Various Investor Types



Source: Citi Business Advisory Services

time frame, the Russell 2000 Index, a performance tracking metric for small public companies, averaged 6.69% per year while the S&P 500 returned 5.91%.<sup>5</sup>

Some recognition from regulators about the unintended results of investor protections is emerging. In June 2020, the U.S. Department of Labor (DoL) issued an information letter indicating that, in limited circumstances, it will allow defined contribution retirement plans (e.g., 401k plans) to indirectly invest in private equity funds. Specifically, the letter allows plans to offer their participants a professionally managed asset allocation fund with a private equity component as an investment option.<sup>6</sup>

The SEC also announced revisions to the accredited investor definition in August 2020, meant to broaden the potential pool of qualified investors. They sought to clarify the rules to “more effectively identify individual investors who have the knowledge and expertise to participate in private capital markets.” Specifically, the rules cited individuals with Series 7, Series 65, or Series 82 designations as well as “knowledgeable employees” of private funds.<sup>7</sup>

These incremental steps may not be sufficient, however, to move the needle on improving investment opportunities for the vast majority of individuals.

### Concerns about Inequality and Retirement Readiness Mount

The wealth gap globally continues to expand for many populations and demographics. Countries where inequality has grown are home to more than two thirds (71%) of the world population. Despite progress in some countries, income and wealth are increasingly concentrated at the top. The share of income going to the richest 1% of the population increased in 59 out of 100 countries based on data from 1990 to 2015.<sup>8</sup> Meanwhile, the poorest 40% of individuals earned less than a 25% share of income in all 92 countries with data.<sup>9</sup>

As the wealth gap grows, individuals worry that they are not ready for retirement. According to a recent study by Aegon, only 20% of young adults say they are on course to achieve their retirement income, and 36% expect to be reliant on their own savings and investments rather than on the government for their retirement income.<sup>10</sup> This lack of preparation is compounded by the fact that life expectancy is continuing to increase as healthcare and medicine improves.

Given these dynamics, there is growing concern that the world may be headed toward a retirement crisis. Individual investors are limited to trading only in the pub-

6 “DOL Creates Path for 401(k) Plans to Offer Private Equity Investment Options”, Todd A. Solomon, Rick Stepanovic, and Brian J. Tiemann, National Law Review, September 11, 2020, <https://www.natlawreview.com/article/dol-creates-path-401k-plans-to-offer-private-equity-investment-options>

7 “SEC Modernizes the Accredited Investor Definition”, SEC, August 26, 2020, <https://www.sec.gov/news/press-release/2020-191>

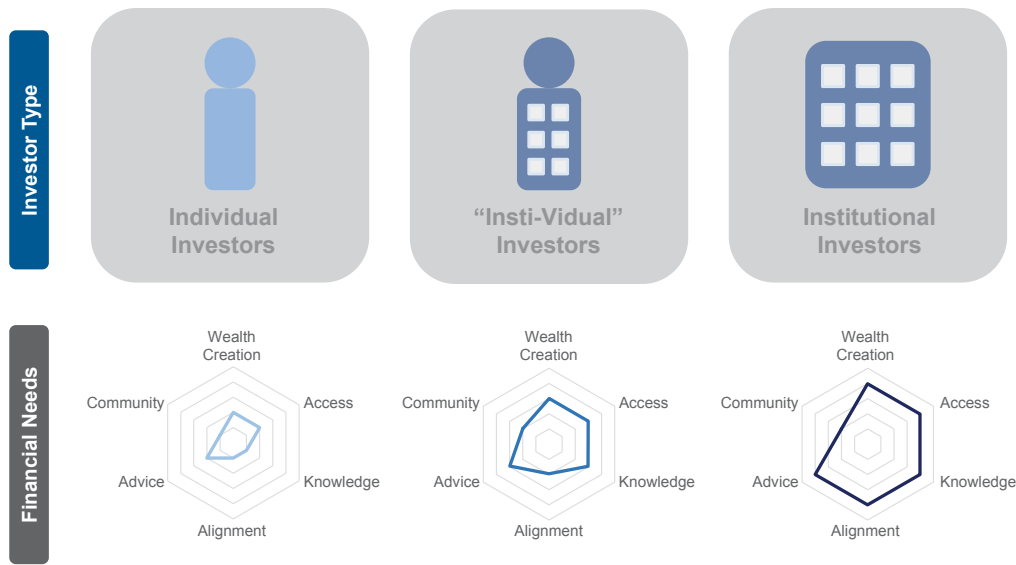
8 “World Social Report 2020: Inequality in a Rapidly Changing World”, United Nations - Department of Economic and Social Affairs, 2020, <https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/02/World-Social-Report2020-ExecutiveSummary.pdf>

9 ibid

10 “The New Social Contract: Young adults reinventing life, work, and retirement”, Aegon Research, January 28, 2021, <https://www.aegon.com/research/reports/annual/the-new-social-contract-young-adults-reinventing-retirement/>

11 “Dalbar QAIB: Investors are Still Their Own Worst Enemies”, Murray Coleman, April 19, 2021, [https://www.ifa.com/articles/dalbar\\_2016\\_qaib\\_investors\\_still\\_their\\_worst\\_enemy/](https://www.ifa.com/articles/dalbar_2016_qaib_investors_still_their_worst_enemy/)

Chart 1.4: Investment Management's Ability to Meet Investors' Perceived Needs



Source: Citi Business Advisory Services

lic markets, but their track record there is worrisome. The Dalbar Quantitative Analysis of Investor Behavior (QAIB) study found that the average equity investor's performance over the 20-year span ending on December 31, 2020 equaled +5.96%, compared to the domestic blue chip IFA S&P 500 Index (+7.43%) and the globally diversified IFA Index Portfolio 100 (+8.29%). In dollar terms, this meant that on a \$100,000 portfolio, the average equity investor earned \$100,000 less than the S&P fund and nearly \$175,000 less than globally-focused fund over that 20-year span.<sup>11</sup>

Erosive investor behaviors persist because the industry has yet to embrace a wider role for servicing individual investors around the delivery of knowledge, alignment, and community. Some early efforts are beginning in this area, but the majority of investment managers continue to follow an intermediated model and expect wealth advisors or brokerage platforms to deliver on those requirements. This may be beginning to change with more asset managers looking to develop and distribute tailored model portfolios rather than discrete, product specific funds, but these solutions represent only a small niche of the market at present.

Compounding the issue of individual investors being under-serviced in terms of their financial goals is the fact that most individual investors have an over-reliance on a single asset—their home, which is problematic for retirement planning. As you go down the wealth pyramid, home equity becomes a greater and greater proportion of net worth. It is 6.9% of net worth for the top 1% households, 22.3% for the top 10% of households, and greater than 50% for the bottom 65% of households. A primary residence is of course, not a liq-

uid asset and overall diminishes any investment diversification for the bottom 65% of households.<sup>12</sup>

***"Whatever this turns into there will be increased demand for differentiated income streams because traditional assets are just not cutting it. If you are a saver anywhere in the developed world, you are not happy, from an inflation point of view you are essentially worse off tomorrow than today."***  
**- Global Asset Manager >\$1 trillion AUM**

***"Retail and smaller financial market participants have been taken advantage of for a long time. They have been on the bottom of the totem pole and subjected to high fees."***  
**- Global Asset Manager >\$1 trillion AUM**

***"There is a high level of information asymmetry in the space and we need a lot of education."***  
**- EMEA Hedge Fund**

### New Digital Offerings Benefit Individual Investors, but Support Emergence of Financial Populism

One result of this perceived inequity is that individual investors are increasingly looking outside the tradi-

12 "Your home as retirement fund - the pros and cons", Nick Green, Unbiased, December 3, 2020, <https://www.unbiased.co.uk/news/retirement/your-home-as-retirement-fund-the-pros-and-cons>

tional investment and wealth management ecosystem for opportunities.

Retail investors are finding their own pathways to becoming knowledgeable financial participants and access a broader set of investments with this trend accelerating in the wake of COVID lockdowns that gave people more time on their hands and more cash in their pockets from stimulus payments in key regions. This is resulting in participants beginning to leverage their investing power in new ways.

New marketplaces are drawing capital and retail-friendly platforms are offering education, analysis, and rightsized investment options for individuals across a broad set of wealth bands. For many individuals, this is resulting in them creating investment portfolios that rely less on professional investment managers. In some instances, their investment activities are also splitting their capital pool with a growing share of investment dollars being invested outside of traditional equity and bond markets.

A sort of financial populism is emerging. Retail investors are becoming more risk-seeking and are looking for opportunities to direct and leverage their own capital, often sharing their own insights and analysis rather than looking to the established industry players. In some forums, in the U.S., there is a growing sense that by banding together to direct their capital, there is an opportunity to stick it to the financial "elite". While this sentiment derives from only a small minority of participants, the broader do-it-yourself phenomenon underscores that with digital engagement. There is a new opportunity to leverage the power of small money

when investors act in concert.

A new "professional" versus "crowd" money dynamic may be emerging.

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*"In the past, our industry created a chasm between us and individual investors as we consider ourselves smarter in how we think about the technical aspects of investing and the person who has the information has the power, but I think the industry has been forced to think differently." - Global Asset Manager >\$1 trillion AUM*

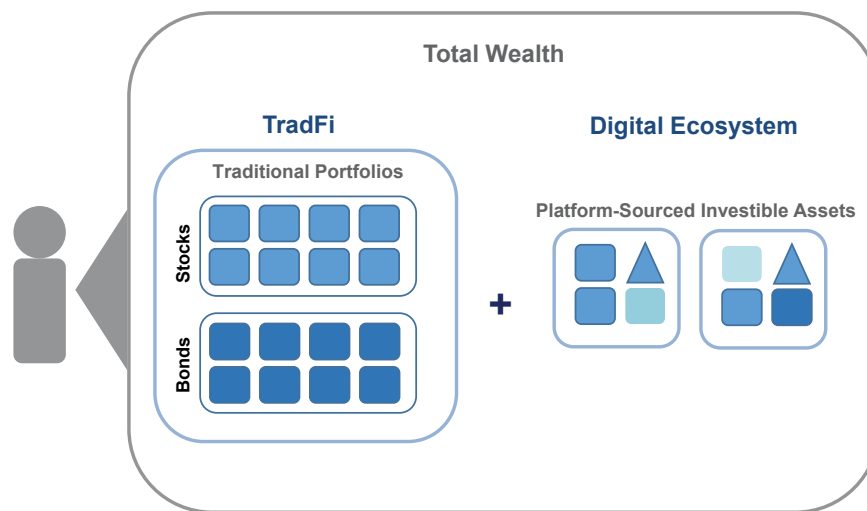
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### New Digital Marketplaces Emerge for Individual Investors

Marketplaces are emerging in the digital realm where individual investors can directly pursue new types of investments to help diversify their portfolio. These opportunities are being sponsored by new entrants originating outside the traditional investment management domain.

One of the most easily accessible options is peer-to-peer lending. The global peer to peer (P2P) lending market grew at a CAGR of around +25% during 2014-2019.<sup>13</sup> P2P involves investors providing capital to borrowers seeking personal, business, or educational

**Chart 1.5: Total Wealth and Individual's Wealth Management Opportunities**



Source: Citi Business Advisory Services

13 "Global Peer to Peer (P2P) Lending Market to 2025 by Loan Type, Business Model, End User, Price Analysis, Competitive Landscape", PR Newswire, December 21, 2020, <https://www.prnewswire.com/news-releases/global-peer-to-peer-p2p-lending-market-to-2025-by-loan-type-business-model-end-user-price-analysis-competitive-landscape-301196835.html>

14 "Should you Invest in Peer-to-Peer Loans?", Kevin Mercadante, Money Under 30, May 12, 2021, <https://www.moneyunder30.com/invest-in-peer-to-peer-loans>

15 ibid

16 "SEC Modernizes the Accredited Investor Definition", SEC, 2020, <https://www.sec.gov/news/press-release/2020-191>

17 "US Equity Crowdfunding Stats Year in Review", Crowdwise, 2021, <https://crowdwise.org/funding-portals/2020-us-equity-crowdfunding-stats-year-in-review/>

loans. Because these loans are unsecured, borrowers are willing to pay higher interest rates, offering investors better returns than in the traditional bond markets. Many P2P investors report annual investment returns of greater than 10%.<sup>14</sup>

Together, the two largest U.S. P2P platforms, Prosper Marketplace and Lending Tree, had cumulatively issued \$22 billion worth of loans from inception through Q4 2020.<sup>15</sup>

Specialized marketing places, enabled by the JOBS Act that was passed in 2012, are opening up other pathways for the U.S. based individuals to invest in private and real assets. The SEC has officially recognized crowd-investing as a regulated investment activity. Rule A+ was released in 2015 expanding the ability to invest in these marketplaces to both accredited and non-accredited investors, although the latter are limited to no more than 10% of their annual income or net worth per year.<sup>16</sup>

A number of new types of investment pools are becoming available to individuals via the crowd-investing approach. These include:

- **Start-Up Companies:** Investors can put money into start-up companies via platforms like WeFunder, StartEngine, and Republic. Collectively, U.S. equity crowdfunding platforms raised \$225 million in 2020, up +64% from \$137 million raised in 2019.<sup>17</sup>
- **Pre-IPO Marketplaces:** Other marketplaces offer access to more mature, late-stage private companies. Examples include Forge Global, SharesPost, and EquityZen. These platforms provide access via dedicated private placement funds and facilitate limited secondary liquidity options.
- **Asset-Backed Investment Deals:** Platforms such as YieldStreet allow individuals to participate in asset-backed investments on a deal-by-deal basis across a variety of categories including commercial real estate, maritime, art, sports, and litigation finance. Similar platforms like PeerStreet and Cadre are also adding automated investing options to support portfolio building in addition to client-selected investments. Those looking for more traditional real estate investment options can directly access REIT shares via platforms like Fundrise and RealtyMogul.

Money moving into these alternative platforms represent a piece of the individual's investment portfolio that exists outside the public markets and professional investment manager domain. These digital platforms encompass a new asset pool that is separate from the traditional financial realm. Thus, individual investors engaged in these models may now hold a mix of both "TradFi" portfolios and digital portfolios as separate portions of their overall investment pool. This is shown in Chart 1.5.

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***"New accreditation rules are opening up access and contributing to investment platforms opening up with new investors coming. We think there will be more allocation to individuals in alternative assets. Social media has made people more aware of other opportunities than ever before."* - FinTech**

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***"Advisors need to differentiate with customer service and access to alternatives. Giving investors access to unique opportunities will likely continue to be a trend in the short to medium term."* - NAM Asset Manager <\$500 billion AUM**

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## **New Digital Platforms and Models Remake TradFi Experience for Individual Investors**

For the portion of the portfolio being managed within the traditional financial (TradFi) sphere, significant changes are occurring that are empowering individual investors to participate in the markets in new ways. Emerging offerings address gaps that the current investment management industry struggles to fill.

### ***Enhanced Access for Small Dollar Investors***

Micro-investing platforms are enabling individuals to participate in the public markets with much lower pools of wealth. Rather than having to wait to accumulate investible capital before moving to build a portfolio, these apps allow individuals to invest funds in tiny increments. Companies like Robinhood and Stash are digital-first offerings, unencumbered by physical office networks or legacy infrastructure. The apps' low barriers to entry, automation, and familiar tap-swipe-buy interface have led to strong traction.<sup>18</sup>

18 "Micro investing apps have been popular during the stock market's rise. Do they work when it dives?", Jennifer Jolly, USA Today, March 8, 2018, <https://www.usatoday.com/story/tech/columnist/2018/03/08/micro-investing-apps-have-been-popular-during-stock-markets-rise-do-they-work-when-dives/390787002/>

19 ibid

20 ibid

21 "Thanks to Fractional Shares, Trading Is Accessible to Everyone", Charles Henry-Monchau, Entrepreneur, March 26, 2021, <https://www.entrepreneur.com/article/367129>

22 "Shares by the slice: Fractional investing sparks a stock market stampede", Thomas Heath, Washington Post, July 10, 2020, <https://www.washingtonpost.com/business/2020/07/10/shares-by-slice-fractional-investing-sparks-stock-market-stampede/>

23 "Chinese stock trading apps the winners amid Wall Street retail mania", Global Times, February 4, 2021, <https://www.globaltimes.cn/page/202102/1214922.shtml>

24 Asia investors top world risk appetite: survey", MarketWatch, July 10, 2012, <https://www.marketwatch.com/story/asia-investors-top-world-risk-appetite-survey-2012-07-10>



Stash lets users pick more than 40 different exchange-traded funds and stocks for a minimum deposit of \$5. According to Stash, since it was launched in late 2015, it's amassed nearly 2 million customers and 5 million educational subscribers, with approximately 40,000 new clients joining weekly.<sup>19</sup> Acorns has grown to 5 million users, allowing its clients to round up credit and debit card purchases to the nearest dollar and then invest their digital change. Robinhood, a stock brokerage app that lets investors buy and sell individual stocks through commission-free trading, has 13 million accounts.<sup>20</sup> These micro-investing applications offer a stepping stone for individuals who have limited income to become beginner investors.

In addition to access through micro-investing, the advent of fractional investing also means that investors can get into portfolios with smaller dollar amounts as it is now possible to build a diversified portfolio with a small budget.<sup>21</sup> Fractionalization allows smaller accounts to hold "slices" of required shares and considerably simplify the client experience as there is no need to calculate the number of shares to buy, but instead allows individuals to enter the market using round dollar amounts.<sup>22</sup>

U.S. investors are not the only audience using these retail direct apps to access the markets in small dollar amounts. WeBull Financial, the Chinese trading app built by a developer that formerly worked at Alibaba and Xiaomi, along with Futu, and Up Fintech are similar retail trading apps enabling Chinese retail investors to invest in stocks in Hong Kong and in U.S. securities. WeBull was downloaded 800,000 times in January 2021, booking more than a 16x surge in new trading accounts.<sup>23</sup>

Retail investors in Asia lead the world in terms of risk appetite and tolerance of volatility, and are keeping a large share of their portfolios in stocks, according to surveys by Nielsen. 56% of the Asia-Pacific investors said they are willing to accept fluctuations of more than 10% in the value of their holdings, compared with 50% in North America, 44% in Europe, and just 38% in Latin America. Around 73% of the investors polled in the Asia-Pacific region said they had invested in stocks, while just 54% said they had invested in mutual funds. In contrast, 67% of North American investors said they had invested in stocks, compared with 57% who had invested in mutual funds.<sup>24</sup>

## **Knowledge Apps to Build Financial Literacy & Inform Trading**

Having the knowledge to understand and apply financial skills is one of the key areas where individuals have struggled. Detrimental investor behaviors are seen as the foundational reason why portfolios for this sector often underperform the market. The emotional responses that retail investors often display when faced with market volatility are what often prompt professional investors to refer to retail as "dumb" money.

New apps are emerging to educate individuals and build more nuanced understanding of financial markets and portfolio behavior. World of Money offers topical videos with knowledge quizzes to help investors check their understanding of core investment concepts. Zogo creates bite-sized lessons and rewards users with gift cards that they can then redeem at popular sites like Amazon, Uber, and Starbucks. Invesmate is designed by financial experts and simplifies investing into jargon-free lessons.<sup>25</sup>

Once individuals build their foundational knowledge, different types of educational content focus in on day-to-day challenges, identifying and evaluating opportunities, and following good investor practices. Stash mixes educational content and games to make learning more engaging. Invstr allows individuals to build and manage a virtual portfolio, investing \$1.0 million in fake cash to allow users to learn more about stocks and to practice managing a portfolio.<sup>26</sup>

Of all these offerings, Robinhood Snacks may be the most widely followed. This product takes two financial articles in the news that day and breaks down what they mean for the average investor in less than 3 minutes. The product suite is omni-channel offering a daily newsletter that as of September 2020 had 20 million subscribers, a 3-minute podcast with 2 million subscribers, a shorter 1-minute podcast called a Snacks Minute that was among Spotify's most popular downloads in 2020, and is moving toward a Snacks video offering to be available on YouTube and Instagram. The goal is to make finance "as culturally relevant as music, sports, and the arts".<sup>27</sup>

## **Enhanced Advice for the Masses**

Digital offerings are providing wealth advisors, investment advisors, and FinTech companies opportunities to "democratize" access and deliver investment advice to individuals with much lower thresholds of wealth than in the traditional advisor-led model.

25 "The Best Financial Literacy Apps for May 2021", Lyle Daly, Motley Fool, April 19, 2021, <https://www.fool.com/the-ascend/personal-finance/financial-literacy-apps>

26 "15 Best Investment Apps For Beginners & Everyday Investors", JD Esajian, Fortune Builders, Accessed May 12, 2021, <https://www.fortunebuilders.com/best-investment-apps/>

27 "Robinhood's financial news team launches its first video series", Anthony Ha, Tech Crunch, September 10, 2021, <https://techcrunch.com/2020/09/10/robinhood-snacks-video/>

28 Digital Wealth Management Report, Business Insider, July 2020, <https://www.businessinsider.com/digital-wealth-management-report>

29 "Acorns Teardown: The Most Popular Robo-Advisor Faces A Fierce Fight As It Goes 'Upmarket'", CB Insights, November 30, 2017, <https://www.cbinsights.com/research/acorns-fintech-robo-advisor-teardown-expert-intelligence/>

30 "Top 5 largest robo-advisers by AUM", Nicole Casperson, Investment News, March 22, 2021, <https://www.investmentnews.com/top-5-largest-robo-advisers-by-aum-204294>

31 ibid

32 "We Analyzed 18 Of The Fastest-Growing Personal Finance Apps Of All Time To Figure Out The Secrets To Their Success - Here's What We Learned", CB Insights, February 10, 2021, <https://www.cbinsights.com/research/personal-finance-apps-strategies/>

33 <https://www.businessinsider.com/personal-finance/what-are-the-best-investment-apps#ellevest>

Robo-advisors within the digital realm have made significant headway in attracting AUM, with market leaders maintaining and extending their positions. The U.S. robo-advisor market represents \$325 billion in assets across 2.3 million clients and is expected to grow to \$830 billion by 2023.<sup>28</sup> Additionally, younger demographics are keen on investing with robo-advisors with 31% of those aged 18-22 and 20% of millennials already having done so, compared with just 13% of Gen X.<sup>29</sup>

Asset Manager-owned robo-advisors currently own the lion's share of the market as Vanguard's Personal Advisor now manages \$212 billion and Charles Schwab's Intelligent Portfolio manages \$58 billion.<sup>30</sup> Whereas the largest FinTech robo-advisors - Betterment, Personal Capital, and Wealthfront - each manage between \$15-20 billion of assets.<sup>31</sup> The majority of these offerings provide free or low cost retirement planning calculators that link investment, banking, and credit card data to model cash flows, account drawdowns, and budgets against various return scenarios to support long-term planning.

Financial planning sites and financial education sites such as Mint.com and NerdWallet, have also sprung up, giving new sources to access knowledge about one's individual financial needs. A host of startups have also emerged to capitalize on these trends and are making it easier to make a budget, invest, and buy stocks, as well as to get loans and credit cards.<sup>32</sup>

### **Portfolio Construction Aligned to Investor Needs**

Another set of online investment offerings are enabling the personalization and tailoring of investment portfolios to align to retail investors' individual circumstances and preferences, but at prices that make these services available to all individuals.

For \$500, E\*Trade offers a core portfolios product that allows investors to fill in a profile to express their goals, time horizon, and risk tolerance and then delivers a tax-sensitive portfolio designed to the investor's requirements. Additional options to customize the portfolio to be socially responsible can be selected to adjust the holdings. Fidelity Go offers a similar service for account sizes as small as \$10, relying not on algorithms but on the Fidelity Go professional investing team that also updates and rebalances portfolios based on their assessment of market conditions. Elleinvest, described as a "female forward" online investment platform, encourages users to build an investment philoso-

phy around their goals, be it starting a business, having kids, or planning for a vacation. Their profile considers the investor's gender, lifespan, and earning potential in addition to the standard questions around risk tolerance and time horizon. The custom portfolio of ETFs recommended to the investor can also be tagged to make socially responsible investment choices.<sup>33</sup>

### **Create Confidence through Community**

Community has become another important aspect of investing for individual investors. Sites such as Clubhouse and Discord have emerged with financial platform offerings, and eToro and Wall Street Bets have come to offer connection and financial opinions - if not vetted insight.

Social networks and recommendations are seen as a huge influence on people's trading decisions. Data from the financial education app, Finimize, found that 94% of its users talk about investment decisions with friends before making a purchase. It's a trend that firms are now working furiously to capitalize on, with many considering moving from a model where users could follow the portfolio of 'experts' to one where they interact more with other casual investors on the platform.<sup>34</sup>

This trend is already being seen by Public.com, which is a startup that describes itself as an "investing social network" - placing heavy emphasis on social tools that help its users to collaborate on investment strategies and educate themselves. The Public community notes that it is about investing in companies, not just trading stocks and believes that investing is one of the most powerful forces for building financial literacy.<sup>35</sup>

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***"There will be an evolution. The positive is that people are engaged with financial assets. There is a healthiness to it." - Global Asset Manager >\$1 trillion AUM***

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***"Real-time demand and customization from clients makes a lot of sense. However, it still doesn't feel like the norm yet. Once it becomes more standard, everyone will want it as table stakes - more custom data in real-time." - Global Asset Manager >\$1 trillion AUM***

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34 "The Next Big Thing in Neobroking: Social Networks", Ryan Weeks, Sifted, March 23, 2021, <https://sifted.eu/articles/neobroking-social-gme/>

35 *ibid*

36 "What's Next for China A-Shares Inclusion in MSCI Indices", Funds Society, December 11, 2019,

<https://www.fundsociety.com/en/news/markets/whats-next-for-china-a-shares-inclusion-in-msci-indices>

37 "Millions of Chinese investors rushed into July's stock market rally", Reuters, August 19, 2020,

<https://www.reuters.com/article/us-china-market-trading/millions-of-chinese-investors-rushed-into-julys-stock-market-rally-idUSKCN25G04R>

38 "Many Americans using their stimulus checks to dabble in the stock market: 'Whatever. I'll give it a shot'", Matt Phillips, The Baltimore Sun, March 21, 2021,

<https://www.baltimoresun.com/coronavirus/ct-aud-nw-nyt-stimulus-checks-stock-market-20210321-r5jhwdrveibbazsd4j4sfansi-story.html>

39 *ibid*

40 *ibid*

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***“People can now get something unique rather than being put into a model and are able to say what they care about and have it taken into account. Technology is already starting to enable the scaling of this approach.” - EMEA Asset Manager \$500 billion - \$1 trillion AUM***

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### ***Rise of Financial Populism and the Power of the Crowd***

As a result of these developments, the digitally engaged individual is able to 1) access non-traditional marketplaces to achieve diversification; and 2) participate in TradFi more seamlessly with small dollar amounts; more knowledgeably with better educational tools; and more effectively through the sharing of insights and strategies with like-minded peers. It was against this background that COVID-19 unfolded, creating an unprecedented set of circumstances that have amped up the importance of and participation in this digital investment realm.

Due to pandemic lockdowns, and in many cases job losses, individuals were spending more time at home, and spending more time online. On top of this sudden shift in environment, many also had unexpected inflows of capital as the U.S. and other nations used stimulus payments to cushion the economic blow being experienced throughout the economy. These conditions helped to drive a surge in investing by small traders.

In China, this boost came to an audience that was already primed to be risk-takers. 80% of domestic Chinese trading markets are dominated by retail participants and many are viewed as “fast-trading” investors.<sup>36</sup> The lockdowns in 2020 resulted in significant acceleration in the level of participation. New stock investors in China increased by +60% in July 2020 from a month earlier, representing a +124% year-over-year increase, according to the China Securities Depository and Clearing Corp (CSDC).<sup>37</sup>

In the U.S., analysts at Deutsche Bank recently estimated that as much as \$170 billion from the last round of stimulus payments could flow into the stock market. They conducted a survey of retail traders in

which respondents said they planned to put roughly 40% of any payment they received into the stock market.<sup>38</sup> Traders between the ages of 25 and 34 said they expected to put half of their stimulus check into stocks.<sup>39</sup> For a decade before the pandemic, small investors accounted for roughly one-tenth of trading activity in the stock market. But in the last year, they have become responsible for close to 25%, according to Goldman Sachs analysts.<sup>40</sup>

For example, investors within Fidelity’s direct platform traded an average of 3.5 million times each day during the first quarter of 2021, up 59% from the year-ago period. Similarly, Schwab processed an average of 8.4 million trades per day in the three-month period, representing a +41% increase year over year.<sup>41</sup>

As individual investors’ become empowered as a larger force in the markets, their participation in online forums and communities has grown as well. Reddit revealed that it now has 52 million daily users, and the number appears to be growing quickly. Reddit told *The Wall Street Journal* that daily usage grew +44% year-over-year for October 2020, a sizable increase on a metric that speaks to just how essential a product it has become to its users.<sup>42</sup> Another study found that 42% of U.S. internet users, between 18 to 24 years old, are using Reddit.<sup>43</sup>

In January 2021, Redditors in a sub-group called WallStreetBets took on the Wall Street elite and drove up share prices of companies that had fallen out of favor with corporate investors due to weak fundamentals. The retail dollar power of this Reddit group, which now boasts over 8.5 million members, was shown when investors purchased shares in one single stock at the same time, forcing hedge funds to cover short positions and causing share prices on the low-float companies targeted by WallStreetBets members to soar. The best known of the so-called meme stocks – a buzzword used in trading circles for stocks that are heavily shorted and can therefore be manipulated to prove a point – was GameStop Corp.<sup>44</sup>

The event, which lasted a little over two weeks in its entirety, climaxed with the making of millionaires, the ruin of a hedge fund, and a political debate set to last weeks as U.S. lawmakers, the Security Exchange Commission, and business celebrities continue to weigh in on the historic event. In the case of GameStop, the platforms appear to be creating an advantage for the

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41 “Fidelity Added 1.6M Millennial, Gen Z Investors in Q1”, Jackie Noblett, FundFire, May 6, 2021, [https://www.ignites.com/c/3165024/396854/fidelity\\_added\\_millennial\\_investors?referrer\\_module=emailMorningNews&module\\_order=5&code=YW05b2JpNWhMbWQxWWIKaGntUkFZMmwwYVMiamlyMHNJRgt6TORFeUIETX-NJRGcITkRFMk16RTB0dz09](https://www.ignites.com/c/3165024/396854/fidelity_added_millennial_investors?referrer_module=emailMorningNews&module_order=5&code=YW05b2JpNWhMbWQxWWIKaGntUkFZMmwwYVMiamlyMHNJRgt6TORFeUIETX-NJRGcITkRFMk16RTB0dz09)

42 “Reddit reveals daily active user count for the first time: 52 million”, Jacob Krastanakes, The Verge, December 1, 2020, <https://www.theverge.com/2020/12/1/21754984/reddit-dau-daily-users-revealed>

43 “Reddit Statistics For 2021”, Foundation Team, January 7, 2021, <https://foundationinc.co/lab/reddit-statistics/>

44 “The Rise And Fall Of Meme Stocks”, Melanie Schaffer, Benzinga, February 8, 2021, <https://www.benzinga.com/news/21/02/19474014/the-rise-and-fall-of-meme-stocks>

45 “GameStop - Backlash By Amateur Investors Against Trading 212”, Joanna Bailey, Mondaq, February 1, 2021, <https://www.mondaq.com/uk/international-trade-investment/I031440/gamestop--backlash-by-amateur-investors-against-trading-212>

46 “The Wisdom of Crowds”, Heritage Investment Group, October 2017, <https://heritageinvestment.com/wp-content/uploads/2017/10/The-Wisdom-of-Crowds-00248392.pdf>

professional investors by preventing these day-traders from trading, which enhanced the frustration and sense of inequality felt by individual investors.<sup>45</sup>

Regardless of the outcome, the episode highlights a new dynamic emerging in the market. Just as political parties and elections in the U.S. have been transformed by small dollar donations, the ability of retail investors to utilize the digital toolkit to mobilize their small dollar investing could prove a lasting change. The days of characterizing institutions and investment managers as “smart money” and individual investors as “dumb money” may be at an end. Instead, we could be moving to a point where the dynamic shifts to increasingly become professional money versus crowd money as the retail population organizes their investing power.<sup>46</sup>

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**“People have been flocking to digital platforms like Wall Street Bets. It allows individuals to feel more connected in a communal sense. I think it does have this anti Wall Street and big bank counter culture feel to it.” - Blockchain / Crypto firm**

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**“We’ve got a whole cadre of people who want to start being able to do things themselves and to express their own views through their investments.” - EMEA Hedge Fund**

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**“There’s a lot of education to be had from individuals that don’t have CFP or CFA attached to their name.” - FinTech**

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## Crypto Domain Offers Retail Investors a Blank Slate to Rewrite the Rules

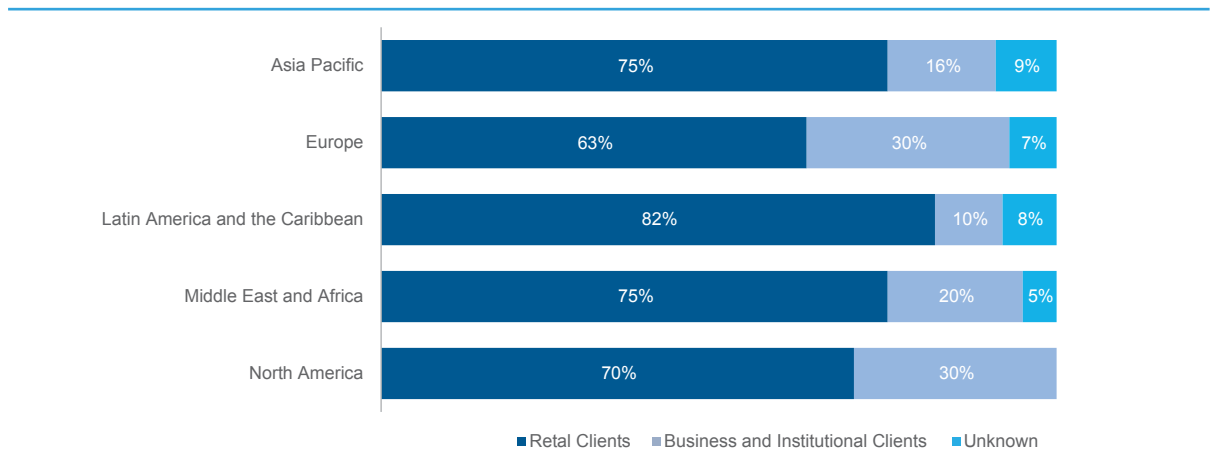
Alongside changes enabled by digital offerings, the emergence of the crypto economy is providing investors an entirely new ecosystem where individuals are afforded far more freedom to access opportunities, leverage their assets more effectively, and build portfolios without gatekeepers to limit their activities.

The crypto ecosystem is global in nature, run across millions of independent nodes all over the world. It is censorship resistant, meaning that anyone with an internet connection can access the marketplace. It is also always accessible, operating 24 hours a day, 7 days a week for 365 days a year.

Most importantly, the unregulated nature of the ecosystem is enabling a type of experimentation and innovation simply not possible in the regulated world. Whereas investment managers are limited in their innovation initiatives by what is *allowable*, the crypto ecosystem is driven by the world’s top technologists and developers who are far more interested in what is *possible*.

Together, with a growing number of retail (and increasingly institutional) participants, the architects of the crypto domain are pushing the boundaries of how financial markets work. They are running real-time proofs of concept every day in an ecosystem that just surpassed \$2.0 trillion in total investment interest as of April 2021—a figure that more than doubled in the first months of 2021 alone.<sup>47</sup> Moreover, they are doing it on a new infrastructure as different from the current state as cloud-based architectures and AI tools were from the mainframes and servers they replaced.

**Chart 1.6: Customer Base Breakdown By Type Share of Total Users**



Source: “3rd Global Cryptoasset Benchmarking Study”, Apolline Blandin, University of Cambridge Judge Business School, September 2020, <https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/3rd-global-cryptoasset-benchmarking-study/>

47 “Crypto Market Cap Surpasses \$2 Trillion After Doubling This Year”, Olga Kharif, Bloomberg, April 5, 2021, <https://www.bloomberg.com/news/articles/2021-04-05/crypto-market-cap-doubles-past-2-trillion-after-two-month-surge>

48 “Bitcoin Is Displacing Gold as an Inflation Hedge”, John Authers, Bloomberg Opinion, April 9, 2021, <https://www.bloomberg.com/opinion/articles/2021-04-09/bitcoin-is-displacing-gold-as-an-inflation-hedge>

## Retail Participants Drive Activity in the Crypto Domain

The majority of crypto assets have one characteristic in common, they are tokens that can be fractionalized down to incredibly small units. Bitcoin, the first cryptocurrency, can be fractionalized down to 1/100,000,000<sup>th</sup> of a single coin. This unit, known as a satoshi after the anonymous founder(s) of Bitcoin, is so small that any investor across the globe should be able to purchase a cryptocurrency for \$1.00 or less. This low buy-in price together with the ability to connect directly via the internet is drawing retail participants into the crypto domain from all over the world. This is illustrated in Chart 1.6.

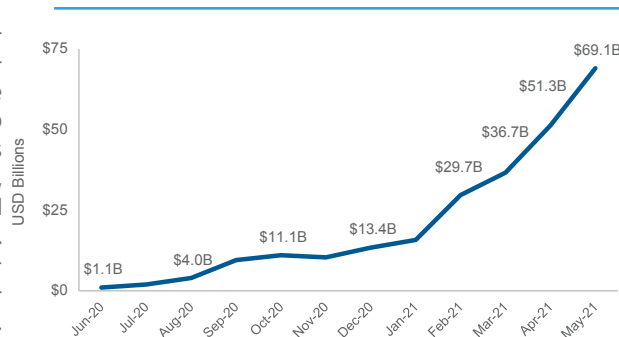
Unlike the TradFi markets, crypto activity is dominated by retail investors as these individuals represent 2/3 or more of the participation from each region of the world. In the same way COVID accelerated participation with the digital investing ecosystem, COVID re-ignited participation in the crypto ecosystem as well. Interest has focused on three areas that will each be discussed in Section II. Briefly, these are:

- **Bitcoin:** As the first and the most widely known cryptocurrency, Bitcoin has recently taken on increased importance for investors as a new type of “digital gold” that fills a niche for both risk assets and inflation hedges in an investment landscape remade by the COVID-19 pandemic. The intersection of low yields and inflationary expectations has increasingly fostered the view that Bitcoin could represent multiple elements such as an inflation hedge, a portfolio diversifier, and a safe haven as traditional government bonds no longer offered that feature in 2020.<sup>48</sup>

This “safe haven” perception might at first seem paradoxical, but a recent survey by Grayscale showed that investors aged 35-44, whom were noted as having “already navigated three recessions and have seen traditional defensive instruments, such as real estate, defensive stocks, and bonds, lose their appeal as hedges against market downturns” are looking outside the TradFi domain, showing the same populist thread of dissatisfaction described earlier in this section.

- **Decentralized Finance (DeFi):** As more wealth was created with Bitcoin’s and the broader cryptocurrency rally in the first half of 2020, investor behavior changed. Rather than treating their holdings as speculative and looking to withdraw crypto earnings and convert them back to fiat currency, more participants began to search for ways to leverage their earnings inside the crypto

Chart 1.7: Total Value Locked in DeFi



Source: Total Value Locked in DeFi, DeFi Pulse, May 3, 2021, <https://defipulse.com/>

ecosystem. Decentralized finance (“DeFi”) was the first recipient of this interest, growing sharply in the second half of 2020 and into 2021.<sup>49</sup>

Users of the decentralized applications are monetizing their cryptocurrency holdings in manners akin to how institutional investors in the TradFi world use their equities and bonds. They are posting their cryptocurrencies as collateral, borrowing against them, lending them, and trading to capture the arbitrage in value between them. There are also entirely new models being explored. These include structuring tokenized asset swaps, participating in savings pools, and seeking returns by participation in prediction markets.<sup>50</sup>

While DeFi is relatively new and the value of cumulative activities remain less than 5% (\$69 billion total value locked) of the overall market capitalization for digital currencies, the space has experienced dramatic growth which is shown in Chart 1.7.<sup>51</sup>

- **Non-Fungible Tokens (NFTs):** The latest topic of discussion emerging from the crypto domain is a new model that looks to wrap a digital asset inside of a token structure and pair it with an embedded smart contract that defines its terms of use. This combo is offered as a single investment package, and unlike the coins used in the Bitcoin and DeFi approaches, these tokens are non-fungible and non-divisible. Interest in the space exploded in recent months. Sales of NFTs reportedly reached \$2.0 billion in Q1 2020–20x the volume of the previous quarter.<sup>52</sup>

With the new capabilities enabled by these models and the freedom of participation provided by the crypto ecosystem’s distributed nature, digitally savvy individual investors are being offered an opportunity to behave in ways that had previously only been available to institutions. Beyond the power of the crowd, this new category of

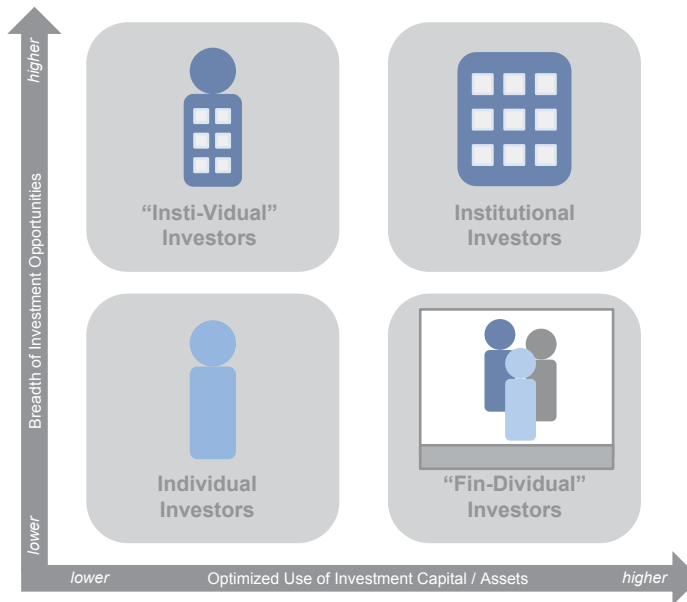
49 “A Beginner’s Guide to Decentralized Finance (DeFi)”, Sid Coelho-Prabhu, The Coinbase Blog, January 6, 2020 <https://blog.coinbase.com/a-beginners-guide-to-decentralized-finance-defi-574c68ff43c4>

50 “Blockchain for Decentralized Finance (DeFi)”, ConsenSys, 2021, <https://consensys.net/blockchain-use-cases/decentralized-finance/>

51 Total Value Locked in DeFi, DeFi Pulse, May 3, 2021, <https://defipulse.com/>

52 “NFT sales top \$2 billion in first quarter, with twice as many buyers as sellers”, Robert Frank, CNBC, April 14, 2021, <https://www.cnbc.com/2021/04/13/nft-sales-top-2-billion-in-first-quarter-with-interest-from-newcomers.html>

Chart 1.8: Delivery of Investment Management to Various Investor Types



Source: Citi Business Advisory Services

investors may end up powering an entirely new type of financial marketplace (NewFi).

**“Digital currencies could really help address some of the issues like inequality in wealth distribution and public policy issues.” - EMEA Asset Manager \$500 billion- \$1 trillion AUM**

**“You can transfer new money globally without paying attention to what bank you are using or where you are. This is disruptive to traditional and local finance.” - NAM Asset Manager <\$500 billion AUM**

**“Retail investors feel like they can’t found the next Facebook, but they can buy something that goes up 10x in a year. How do I as a retail investor get to the upper end of the inequality spectrum?” - NAM Hedge Fund**

**“DeFi will increase the pace of idea generation tremendously, and new ideas could come from pretty much anyone. There is nothing like it in traditional finance at all.” - DeFi Protocol**

### The Emergence of the “Fin-Dividual” Investor

The nature of the crypto domain, and participation in crypto coins and decentralized finance are working to address gaps in individuals’ opportunity, access, and yield.

This is resulting in the emergence of a new category of investors that we have dubbed “Fin-Dividuals”. These investors look at the potential of each asset they hold in their portfolio and determine the most effective use of that asset to amplify their returns or yield. In this way, they operate with the same mindset as an institutional investor, although their ability to access opportunity pools to perform these activities is far more limited. This newest type of investor is shown in Chart 1.8.

These investors can participate directly in the crypto domain, acting as their own market makers, posting their assets as collateral, lending them, borrowing others’ assets, and trading derivatives against them all without interacting with an intermediary and without engaging a single participant in the traditional financial ecosystem.<sup>53</sup>

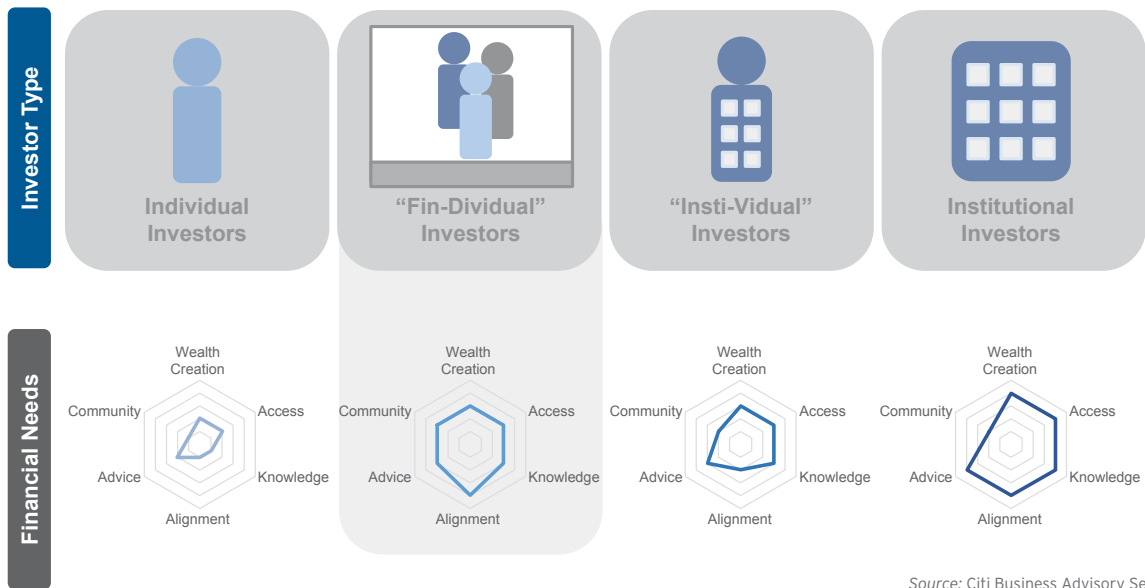
Their participation in the crypto domain is creating a decentralized network effect that is bringing more cash, interest, and participants into the space thus compounding the opportunities for wealth creation. Moreover, the options available to these fin-dividuals to even more effectively utilize their assets continue to expand.

53 “Decentralized Derivatives, The Beginner’s Guide”, Sarah Rothrie, Crypto Briefing, The Beginner’s Guide, February 6, 2020, <https://cryptobriefing.com/decentralized-derivatives%e2%81%a0-beginners-guide/>

54 “Morgan Stanley becomes the first big U.S. bank to offer its wealthy clients access to bitcoin funds”, Hugh Son, CNBC, March 17, 2021, <https://www.cnbc.com/2021/03/17/bitcoin-morgan-stanley-is-the-first-big-us-bank-to-offer-wealthy-clients-access-to-bitcoin-funds.html>

55 “UBS Exploring Ways to Offer Crypto Investments to Rich Clients”, Ambereen Choudhury, Bloomberg, May 10, 2021, <https://www.bnnbloomberg.ca/ubs-exploring-ways-to-offer-crypto-investments-to-rich-clients-1.1601595>

Chart 1.9: Emergence of Crypto Economy Aids Digital Economy's Ability to Meet Investor Needs



Source: Citi Business Advisory Services

As we will address in Section III, these same participants are beginning to diversify into not just optimizing the use of their assets, but being able to mint, make markets around, and exchange their own digital assets, allowing these individuals to extend from simply being an investor into being an “issuer”, and a creator. While fin-dividuals today try and mirror what sophisticated institutions are able to achieve in TradFi, their actions may become the template that both companies and institutional investors follow in an emerging NewFi economy.

With opportunities in the crypto domain complementing and advancing the abilities enabled by the digital economy, fin-dividuals are able to address more of their own investment needs, and show a dramatic divergence from individuals engaged solely in the TradFi world. This is shown in Chart 1.9.

The need to hold underlying cryptocurrency, DeFi, and NFT investments in digital wallets linked to blockchain technologies is further fragmenting the investment pool. Fin-dividuals’ portfolios may have some money in traditional investment accounts, some in crowd-funded assets or fractional portfolios housed on digital platforms and some crypto holdings in wallets. This is shown in Chart 1.10.

Not only does this make obtaining a unified portfolio view and assessing portfolio level risks more difficult for the individual, it also makes optimizations that may be occurring in their traditional portfolios less relevant. While investment managers race to improve their solutions practices in order to offer wealth clients a more tailored experience, the set of assets that they are looking to optimize may begin to represent a shrinking portion of many individual’s portfolio.

Already, wealth advisors are moving to allow their clients to hold cryptocurrencies. Morgan Stanley Wealth Management has announced that they will allow clients to hold Bitcoin, but it will be limited to 2.5% of an individual’s net worth, and only available to those with “an aggressive risk tolerance” and \$2 million or more in assets.<sup>54</sup> UBS Group AG is in the early stages of planning to offer wealthy customers digital currency investments, joining U.S firms in seeking to give broader access in response to client demand.<sup>55</sup>

If traditional investment managers cannot service those portions of the portfolio, new entrants may gain footholds. Given the level of technology innovation happening in the crypto domain, this may put investment managers at risk of seeing their equities and bonds swept up in new crypto portfolios rather than the other way around. This is one of several potential risks facing the investment management industry and the broader TradFi ecosystem.

56 “Cypherpunks”, Haseeb Qureshi, Nakamoto, December 19, 2019, <https://nakamoto.com/the-cypherpunks/>

57 Vitalik Buterin Net Worth, Celebrity Net Worth, Accessed May 12, 2021, <https://www.celebritynetworth.com/richest-businessmen/business-executives/vitalik-buterin-net-worth/>

*“With decentralization, we are having new ways to build a bond with people we want to connect with. Now we are our own social network.”*  
*- Blockchain / Crypto firm*

*“What DeFi creates is the quality of access that does not discriminate. Everyone with assets has the credibility to make transactions with their assets on the blockchain network.”* - Blockchain / Crypto firm

*“Back in the 2008 there were a lot of centralized power that failed us. It was all human mistakes and humans are flawed. With DeFi you could have global decentralized protocol, and there are incentives to actually make the protocol better and everyone work harder.”* - Retail Investor

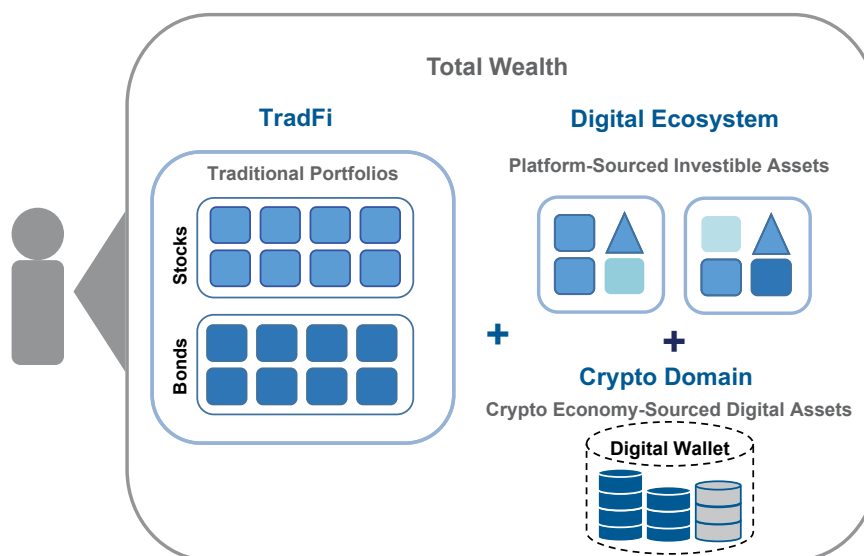
*“The do it yourself model has expanded. The number of people’s kids who are on Robinhood or mined Bitcoin are obtaining experience that is far greater than what I had known about investing in stocks with Fidelity when I was their age. I think accessibility has risen.”* - Global Asset Manager >\$1 trillion AUM

## Crypto Presents New Types of Risks that Differ from Earlier FinTech Innovations

To date, these new pools of capital and the emergence of “Fin-Dividual” investors have not been a large threat to the broader investment management universe. Indeed, many incumbents view developments in crypto with derision or have blind spots about its potential and future impact. There are several risks in taking such a dismissive view, however. These are categorized below:

- *Decentralized, Community-Based Ecosystem:* There is an ethos that underpins the entire cryptocurrency experiment related to its roots in the “cypherpunk” movement—a loosely affiliated group of individuals who believed that cryptography should be used to preserve sovereignty and privacy on the internet.<sup>58</sup> The code underlying each major cryptocurrency and blockchain project is produced collaboratively by peers, published transparently, and developed for the community rather than the property or business of a single entity. Participants are constantly looking to “self-disrupt” and challenge one another. When the community disagrees on the direction a project is taking, there will often be a “fork” and a sub-set of the community will break off and create their own version of the previous project. This leads to an environment of perpetual innovation.
- *Top Development Talent:* The competitive nature of the crypto experiment and the appeal of the philosophy is helping to draw some of the top

Chart 1.10: Total Wealth and Individual's Wealth Management Opportunities



Source: Citi Business Advisory Services

58 "Talent Drain You Can't Ignore: Cryptocurrency", Deepali Vyas, LinkedIn Pulse, October 4, 2018,

<https://www.linkedin.com/pulse/talent-drain-you-cant-ignore-cryptocurrency-deepali-vas/>

59 Vitalik Buterin Net Worth, Celebrity Net Worth, Accessed May 12, 2021,

<https://www.celebritynetworth.com/richest-businessmen/business-executives/vitalik-buterin-net-worth/>



developers in the world to these projects and is helping to create technology “superstars” such as Vitalik Buterin, the founder of Ethereum—one of Forbes “30 Under 30” award recipients.<sup>57</sup> Convincing talent to exit the space to rejoin traditional companies may be difficult. Indeed, the crypto domain is already luring financial talent away from legacy firms including top software, engineering, coding, and other talent from big-name tech companies just as the tech companies lured this talent from the banks. Coinbase, for example, just hired a former Twitter and Salesforce executive to improve its customer support operations.<sup>58</sup>

- **Financial Incentives Tied to Code:** One of the biggest shifts from the original open source community to the crypto domain is the use of tokens and coins as a means of rewarding members of the community that make meaningful contributions to the code. This allows for extensive wealth creation as the value of such tokens and coins increase for successful projects and protocols. For example, by 2021, Vitalik Buterin’s net worth was estimated at \$16 billion.<sup>59</sup> One survey participant noted that their protocol had agreed to recruit 4 smart contract developers to their community at a minimum starting salary (to be paid in coins) of \$750,000 each. Having a financial stake in their code and confidence that their success will cause their stake to appreciate makes it unlikely that the talent will be willing to migrate to the TradFi world where they are only paid a salary and bonus.”
- **Protocols, Not Companies:** Unlike the entrepreneurs driving innovation in the fintech realm, there is no “company” to purchase or to partner with in order to absorb innovative new capabilities into the traditional financial ecosystem. Moreover, the way in which the code is enabled is not through “software” but through “protocols” that basically wrap the entire set of code for a process in a manner that makes it plug and play with any other set of code. The entire internet was built on the concept of protocols such as “HTTP” but now there are many new protocols to do things such as to “borrow securities”.
- **User Participation Model:** The final consideration for the traditional financial industry is that the crypto domain extends its concept of community to anyone who uses the ecosystem. Buying certain tokens not only entitles the user to participate in the service being offered, but it offers them the same potential as the developers to see the value of that coin or token appreciate. The user may even receive more tokens for free for having helped to support the protocol. Other types of tokens allow participants to be part of the pool that votes on the future of how the protocol will

be developed and can reward them with more tokens for having voted.

These are very different operating principles than those driving TradFi. Section II explains these concepts and the overall crypto ecosystem in more depth.

Given the community-driven and self-rewarding nature of the crypto domain and their commitment to building a new financial ecosystem based on what is possible, the growth of this ecosystem is creating a new dynamic that the TradFi world has not yet faced. Innovations that develop in the crypto domain may thus prove much more of a disruptive threat to the industry than anyone today may realize. Participants are so focused on pursuing their current strategies that they may not realize that the game itself may be changing.

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***“When it comes to the investment industry, there’s not much innovation going on outside the crypto world.” - EMEA Asset Manager <\$500 billion AUM***

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***“It will no longer be a sustainable model for financial institutions to build their own infrastructure. With commercialized open-source software services, there could be a global community of developers maintaining the infrastructure instead of just a few developers. I think it is very attractive not only from a risk perspective but also from a business continuation perspective.” - Blockchain / Crypto firm***

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***“The technology changes the way you can construct finance. Everything you see in consumer and retail is just about changing distribution. It’s not about changing the underlying product. Those are unchanged in traditional finance, but cryptocurrencies allow us to rebuild those primitives.” - Blockchain / Crypto firm***

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***“In the good old days, the most talented people went to the banks. 10 years ago the most talented people went to the internet companies. Now these guys are looking at the crypto space and what they can build there.” - NAM Asset Manager <\$500 billion AUM***

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## Section II: The Crypto Domain as the Petri Dish of Innovation

The emergence of “fin-dividuals” as a new investing persona validates the efforts and marks an achievement of the goals set out by the developers that helped to create the crypto ecosystem. Offering *anyone* an opportunity to engage in financial transactions and empowering them to perform tasks that had previously only been available to select participants and performed by trusted intermediaries is the foundational principal of the crypto “ethos”. Trends that fit into this category include the shift from actively managed to passive funds, the growth of ESG, and the efficacy of factor investing and factor-driven risk models.

Enabling this type of environment required solutions to technological and cultural issues that had never been attempted at this scale. Creating a global, decentralized, peer-to-peer network that can operate in a “trustless” environment, in which users don’t need to trust any particular individual, corporation, or government to enjoy a predictable outcome, and represents a monumental achievement regardless of whether one believes that the assets being traded or the models being pursued in this space merit serious consideration.

Not only is the crypto domain creating a new system, it is simultaneously operationalizing it. The code that is testing out new concepts and the blockchains that are working to accurately track and verify transactions are running 24/7/365. Never has a proof of concept occurred at such scale.

The fact that the vast majority of this experimentation is happening outside of regulatory oversight can be seen as both an issue and a benefit. It is problematic because it makes it hard for those that operate in a regulated domain to participate, even if they want to be able to contribute. Successful models have a harder time crossing into general use because there is regulatory uncertainty. On the other hand, the level of creativity in the space and the sense that all paths are available, make it an unparalleled petri dish for innovation. It is hard to know what might grow, but things that successfully emerge from this ecosystem may prove transformational.

To evaluate whether, and if so, how much, these new models may change the world requires at least a basic understanding of the components, how they operate, and why the technology is foundationally different than previous capabilities.

### Understanding Components of the Crypto Ecosystem

Bitcoin and a variety of cryptocurrencies have captured headlines recently, however, these payment coins represent only a fraction of the emerging crypto ecosystem. To understand the wider potential of blockchains or distributed ledger technology (DLT), and the applications of decentralized finance, we first need to understand their component parts, how they fit together, and how they deliver value. For definitions of terms, extended explanations, and further reading on the DeFi concepts raised in this section, please refer to the Appendix Glossary.

To begin, it is helpful to understand that not all coins and tokens within the crypto ecosystem are currencies, and that while “coins” and “tokens” are often used interchangeably, they are different. In the crypto ecosystem, coins are primarily used as money, and exist to be a store of value and a value transfer mechanism. By contrast, tokens have much broader utility and can represent any existing physical or digital asset, or even access and ownership rights. While many types of coins and tokens are likely to emerge over time, there are three fundamental types which are key to understanding the crypto ecosystem.

#### Payment Coins

The first and most widely known coins are payment coins. As discussed extensively in the Citi GPS report *Bitcoin: At the Tipping Point*,<sup>1</sup> Bitcoin was originally created as a decentralized payment network, with the coin itself (BTC) conceived to power the payment network by being issued as a reward for transaction validation, not for use as an independent currency. The payment network’s launch in 2008 was the first real world application of what we know today as blockchain technology.

<sup>1</sup> “Bitcoin: At the Tipping Point”, Sandy Kaul and Richard Webley, Citigroup, March 2021, <https://www.citivelocity.com/citigps/bitcoin/>

A blockchain is a decentralized, distributed digital ledger of transactions, each of which is bundled into a “block” that is validated and then linked to previous transaction blocks using a cryptographic process to ensure that the work has been done to vet the individual entries. Recordkeeping on a blockchain means that every transaction and their entire history is transparent, able to be seen by any user of the blockchain.

Blockchain’s early use as a ledger for cryptocurrencies—primarily Bitcoin—made it the first truly global payment network that was accessible to anyone, with no infrastructure required beyond an internet connection. Its functionality as a payment mechanism was revolutionary for several reasons.

First, blockchain technology could move both the *asset* and the *transaction information* simultaneously *in one data package*. This is in contrast to traditional payment systems, such as SWIFT, which operate as a messaging system to send the transaction information, but the actual payment is moved separately.

Second, Bitcoin solved the problem of double spending in a decentralized setting. This occurs when someone is able to use the same unit of digital currency in multiple transactions. Double spend is prevented in blockchain-based currencies by using one form of consensus computing known as “Proof of Work.” This is carried out by miners on the blockchain who work to validate blocks of transactions and are rewarded for this endeavor with the generation of new Bitcoin.

The reward mechanism incentivizes miners to ensure the integrity of the system as their participation increases their stake in it, their validation work ensures that a coin is only spent once, and the considerable resources they are required to expend in openly competing to validate the block ensures their honesty. While Proof of Work does not make double spending logically impossible it does make it extremely difficult, or “computationally uneconomical”, as one survey participant put it.

As highlighted, new Bitcoins are minted whenever a miner validates a block of transactions and adds it to the Bitcoin ledger. However, the original code of Bitcoin sets a limit on the number of coins that can be minted: 21 million. This creation of scarcity in a fungible digital asset, along with it being governed by its code outside the control or influence of any institution, is a key element of Bitcoin’s appeal.

Over a decade after its inception, Bitcoin’s combination of *immutability, accessibility, and efficiency* have helped make it the most popular digital currency by some margin. Bitcoin’s roots as a payment system have grown, and it is now becoming more widely adopted as a currency, and even considered a store of value by an increasing number of people.

Bitcoin is just one of many of digital payment coins—others include Litecoin, Monero, and Stellar among many. Bitcoin’s creation, however, marked a watershed moment in the evolution of financial services. Bitcoin introduced blockchain and digital wallets to the world and spawned a multitude of innovations in technology and business models alike as millions of people build on its open source code.

### Stablecoins

The second essential component of the crypto ecosystem is stablecoins. These are cryptocurrencies which peg their value to an external reference unit—currently primarily the U.S. dollar. Stablecoins have grown into a dynamic marketplace with a market cap of \$90 billion and they serve as a critical link between the crypto and fiat currency systems.<sup>2</sup>

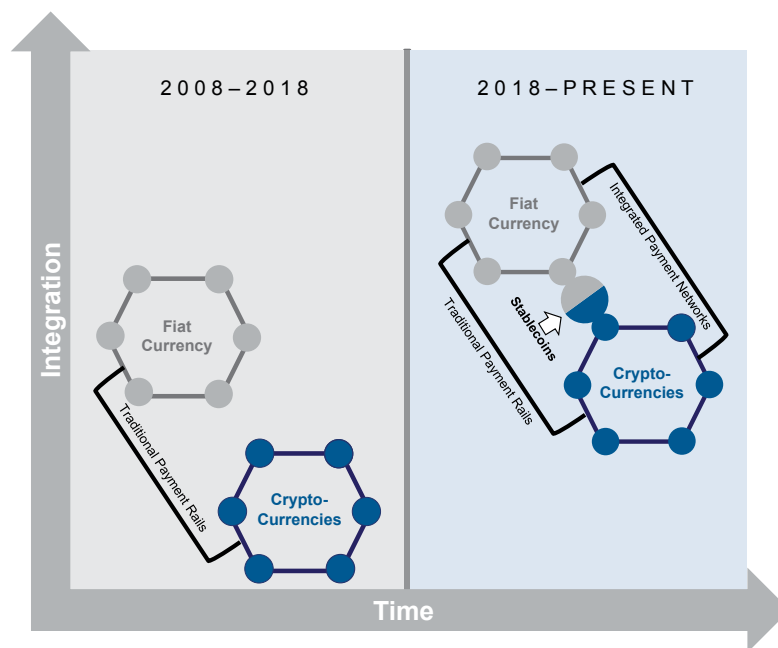
The most popular stablecoins hold collateral in a fiat currency (government issued currency) and mint one stablecoin for each unit of fiat currency received (1:1 ratio). Another set of stablecoins use a basket of cryptocurrencies (which may include fiat-backed stablecoins), as collateral and peg the value of that basket to the target fiat currency, using algorithms to constantly monitor and adjust the collateral pool. Because of the volatility inherent in the underlying collateral, these cryptocurrency-backed stablecoins typically hold twice as much collateral (2:1 ratio).

Stablecoins serve a unique function in the crypto ecosystem as on and off ramps. When cryptocurrencies were first emerging, there were limits on how much fiat currency could be moved *into* the crypto ecosystem using traditional payment rails such as wire transfers, ACH, or debit/credit cards. Banks were also unable to accept deposits from crypto industry players such as exchanges. These businesses had no way to transfer large amounts of crypto earnings *out of* the ecosystem and exchange it into a fiat currency to pay individuals and fund operations.

By tying the value of the coin directly to a more stable fiat currency, both use cases were solved. Those looking to move large amounts of fiat currency into the ecosystem could post their fiat currency as collateral with an off-chain entity that would then create (mint) an equivalent number of blockchain-based stablecoins for the depositor. Those looking to move money out of the crypto ecosystem could buy the stablecoins and redeem them for the underlying fiat currency which was held as collateral, causing the blockchain-based coin to be destroyed (burned) and the fiat currency to be transferred from the original depositor’s to receiver’s account. The receiver could then transfer the fiat currency to their regular bank.

<sup>2</sup> “Stablecoins by Market Cap and Volume”, CoinCodex, Accessed May 12, 2021, <https://coincodex.com/cryptocurrencies/sector/stablecoins/>

Chart 2.1: Evolution of Payments Ecosystem



Source: Citi Business Advisory Services

Stablecoins thus act as a bridge between the fiat and cryptocurrency realms as shown in Chart 2.1.

Stablecoins also make it possible to *hold* large amounts of money within the crypto ecosystem without worrying about the volatility of the underlying coins. A user can post their cryptocurrency as collateral and get a stablecoin tied to a much less volatile fiat currency. They can hold the stablecoin for as long they require knowing that it will keep its peg near that fiat currency value. When they are ready, the holder can sell their stablecoin for another cryptocurrency. Almost all leading cryptocurrencies trade as pairs against the top stablecoins.

Given this utility, stablecoins are a critical part of the crypto domain. In mid-May 2021, Tether, the largest fiat currency-backed stablecoin had a market cap of \$54.9 billion and had processed \$318 billion in on-chain volume during the month of April 2021. DAI, one of the leading cryptocurrency backed stablecoins had a market cap of \$4.8 billion and had registered \$32 billion in on-chain volumes in April 2021.<sup>3</sup>

### Decentralized Apps (Dapps) & Platforms

The third core component of the crypto ecosystem are decentralized apps, or “Dapps” and the platforms that they are built upon. In a sense, the offerings are akin to apps and the Apple app store, but instead of being hosted on a corporate platform, they are built on top of a decentralized platform. Chart 2.2 illustrates the

difference between a payment network like Bitcoin and a decentralized platform with Dapps like Ethereum, the first and most widely known example of this model.

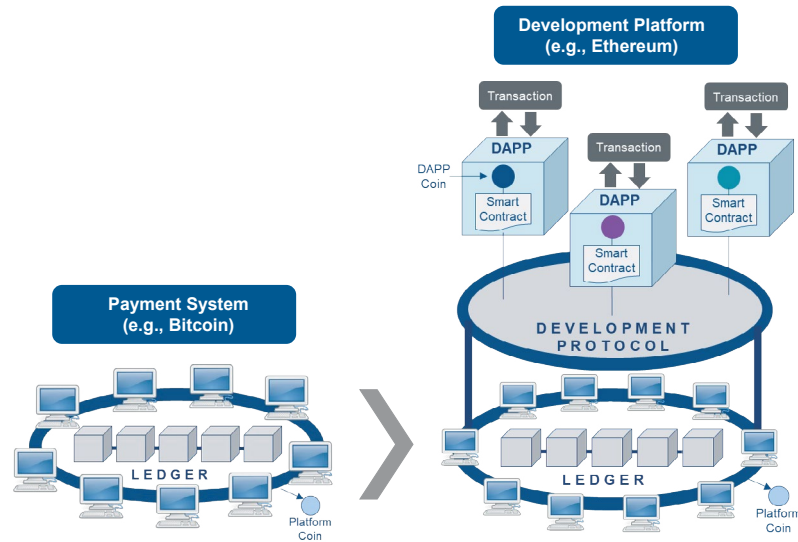
The Bitcoin payment system has its payment coin (BTC) that is used to reward miners for verifying transactions on the Bitcoin blockchain. A decentralized development platform also has its own payment coin. For example, the Ethereum platform has Ether (ETH). The decentralized development platform’s payment coin is also used to pay for verifying transactions on the platform’s blockchain, but the recording of payments is just one aspect of the service offered.

Decentralized platforms also offer a toolkit that allows developers a standardized way of creating Dapps by allowing processes to be designed as a unique set of executable code and operate autonomously within the platform’s ecosystem. Each Dapp requires users to pay for services in the platform coin. Some Dapps also issue their own tokens. These tokens entitle the owners to either claim a service or participate in the oversight and growth of the Dapp. When an individual buys a token, they must still pay for it in the platform coin. This allows the underlying blockchain to record all transactions and allows those Dapps with their own tokens to see a complete record of their transactions.

For example, CryptoKitties and Compound are both Dapps that exist within the Ethereum ecosystem. Users can directly access both and pay for transactions in the Ethereum platform coin ETH. CryptoKitties does not have

3 "Coinmetrics - Network Charts", Coinmetrics, April 2021, <https://charts.coinmetrics.io/network-data/>

Chart 2.2: Payment Systems Vs. Development Platforms



Source: Citi Business Advisory Services

a token that it offers independently whereas Compound issues its own native token—COMP. Users can buy or sell the COMP token regardless of whether they are transacting within the Compound Dapp. The buyer and the seller would still pay for their COMP transaction in ETH, but the purchase and sale of COMP would be tracked in its own sub-ledger within the Ethereum blockchain. Payments in ETH are often referred to as “gas” since this is the resource required to run the system.

While Ethereum is the most popular blockchain on which Dapps are built today, other blockchains such as Polkadot, Cardano, and EOS have emerged and many others are still being developed. Extremely high gas fees for the Ethereum platform which have soared recently due to the volume of usage, are creating an opening for other competitors. The proliferation and popularity of these development platforms points to a future where organizations are built, and products and services are created and delivered, in an entirely new way.

**“The problem with Bitcoin is you always want to switch back to dollars. You need to monetize it in order to use it. Bitcoin in itself is not really valuable until we can sell it.” - EMEA Investor**

**“You can’t always use bitcoin to pay for goods and services because it’s incredibly hard to hedge in a way that mitigates the volatility. Stablecoins could make a real difference here.” - Consultant**

**“People might just use crypto rails to get access to the US dollar. It’s hard to get velocity going on using Bitcoin for payments because it is an asset that by design is scarce.” - Blockchain / Crypto firm**

### Understanding Dapps as a Signpost of Innovation and a New Type of Proto-Company

Dapps and their respective coins can be thought of as a new value model and a jumping off point for understanding the potential of a peer-to-peer economy with decentralized governance. They offer a framework for how services and products can be created and monetized in a whole new way.

#### What Makes Dapps Different than Apps?

In some respects, Dapps function in the same way as other “apps” in the tech universe, but there are also a number of key differences.

- **No Central Control:** Dapps run on peer-to-peer or decentralized blockchains like Ethereum, where no one person or entity has control of the network or Dapp. Instead, users work as a community, multi-laterally engaging with each other to arrange transactions, set Dapp objectives, and conduct any function inherent to the Dapp’s operation.
- **Transparent:** Dapps record their transactions in the blockchain of the underlying platform. Data and records are public and anyone participating on the underlying blockchain can see all the Dapp’s transactions and transactional information.

- *Use of Tokens:* Some Dapps create and manage their own supply of tokens. There are different types. Utility tokens entitle an owner to use the Dapp's services. They control access so that the Dapp can ensure that the user has a legitimate claim to services. This would be like going to an amusement park and then buying tickets to ride a special attraction. There are also governance tokens that allow holders to participate in the management and development of the Dapp. These tokens can be given as incentives to those that contribute and help to build, improve, or operate the Dapp. There is no known equivalent at present in the TradFi world. In essence, it would be like receiving a share of "Bank X" stock and being given an opportunity to vote on the board of directors in exchange for opening a new bank account.

Dapps have increased in popularity in the last year, and they are being built to facilitate a wide array of functions from gaming to social media and now, to financial applications. They have a front-end, mobile interface like that which a user might experience with any traditional app. Functions range from Dapps like IDEX, which operates like a traditional exchange for cryptocurrencies, to online games like Alien Worlds, a metaverse where players create, own, and play with their own digital representations of aliens.

### How Do Dapps Work?

Dapps are made possible by smart contracts whose code is executed by the miners of the platform on demand. These contracts are actually pieces of code that define the terms of a transaction and allow the transaction to be programmed to run autonomously based on customizable or predefined triggers or events.

For example, a smart contract could be written to release funds on a specified date such as paying rent on the 1st of every month. In a more complex and multi-stage example, a contract could be programmed to complete a series of inter-related steps such as those required to mint a cryptocurrency stablecoin—accepting a collateral deposit from a specific wallet address, informing the depositor of how many stablecoins that collateral would equate to, obtaining their affirmation that they want to proceed, minting the stablecoins, and then recording the transaction by transferring the collateral out of and depositing the stablecoins into the individual's wallet.

To write a smart contract, developers define all steps of a transaction, and enable each of these steps to occur with code. The smart contract *code acts as the counterparty* to the individual performing a task in the

system, rather than that counterparty being a centralized platform or exchange. This enables the "trustless" operations of the decentralized ecosystem. It represents a new paradigm of "peer-to-peer" transactions and business models. Individuals can transact with or collaborate with other individuals without needing to know who they are, or to trust them.

The other piece of infrastructure helping to enable the crypto domain refers to decentralized oracle networks. Smart contracts often have specific data triggers built into them. For example, a weather prediction contract may entitle the holder to a monetary reward if the rainfall in a given month were below average. Oracle networks look off-chain at weather data APIs and then calculate the required information and deliver it into the smart contract so that the event described in the contract will either be triggered or cancelled.

### Who Decides How they Operate?

In their early stage, most Dapps have a community of developers that come together on an informal project basis to design something new, negotiating and designing the rules through consensus. These projects look to raise capital to fund these operations. For a period in 2017-2018, projects would conduct an initial coin offering (ICO), but widespread fraud and regulatory pushback quickly dampened enthusiasm for that approach. In January 2018, there were 160 independent ICO projects ready to close and in October 2019 there were none.<sup>4</sup>

Since that time, a new model has emerged. Many early projects are now opting to use initial exchange offerings (IEOs) where developers introduce their tokens using an existing cryptocurrency exchange. This approach reduces the chances of fraud, simplifies certain regulatory requirements, and takes advantage of an already existing user base, thus increasing investor confidence.<sup>5</sup>

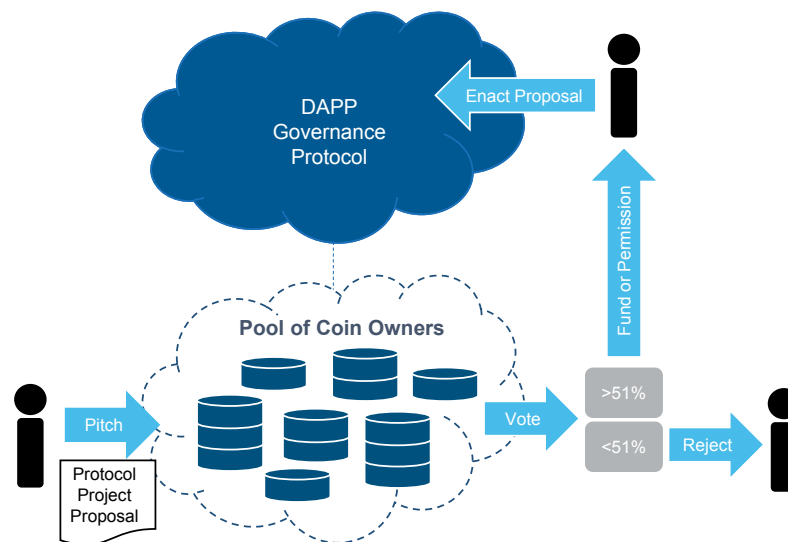
As the Dapp becomes operational and the set of users grow, a subset of Dapps, particularly those that deal in financial transactions, transition to a more formal operating structure. These are known as *Decentralized Autonomous Organizations (DAOs)*.

DAOs are organizations run according to rules set by transparently coded algorithms, and for functions that cannot be accomplished by code alone, they are governed and administered by the members of the organization. Individuals join the organization by purchasing the governance token issued by the DAO or are invited into the DAO through the award of tokens. No central governing body leads these entities, and all of their respective transactions and records are maintained openly on the blockchain.

4 "How Cryptocurrencies are Evolving Past the Traditional ICO", Peter Daisyme, Due, March 10, 2020, <https://due.com/blog/how-cryptocurrencies-are-evolving-past-the-traditional-ico/#:~:text=ICOs%20became%20incredibly%20popular%20after,and%20total%20value%20of%20ICOs.>

5 *ibid*

Chart 2.3: How Decentralized Autonomous Organizations (DAOs) Work



Source: Citi Business Advisory Services

A governance token enables anyone with interest to buy into the DAO and help to run the Dapp. For example, the MakerDAO is the organization that governs the protocol that mints DAI stablecoins. The MKR governance token is required to vote on the parameters of MakerDAO.

Once established, the DAO becomes the governing body that determines how the code that delivers the Dapp can be adjusted and determines whether or not to authorize other administrative decisions such as whether to hire staff, approve salaries etc. Those looking to enhance the code or propose a role are able to pitch their ideas and put them up for a vote to the DAO token holders.

Anyone who holds the DAO tokens can vote on and shape the direction, functions, and capabilities of the Dapp's organization. When a project requiring payment is approved (e.g., hiring a dedicated smart contract developer), the funding is provided via the governance token. As businesses mature, the DAO token holders can also vote to grant themselves a share of the Dapp revenues as a profit, much like getting a dividend for owning stocks. Chart 2.3 illustrates these aspects of a decentralized ownership structure.

### DAOs Enable a New Proto-Company Model

A Dapp that has extended its functionality and created its own DAO can begin to be looked at as a form of proto-company. They have an operating entity, they provide a service, they can track their sales and

expenses and they have formal development plans that any interested party can access and evaluate. Some are starting to hire full-time employees to build out functions rather than just focusing on developers and coding.

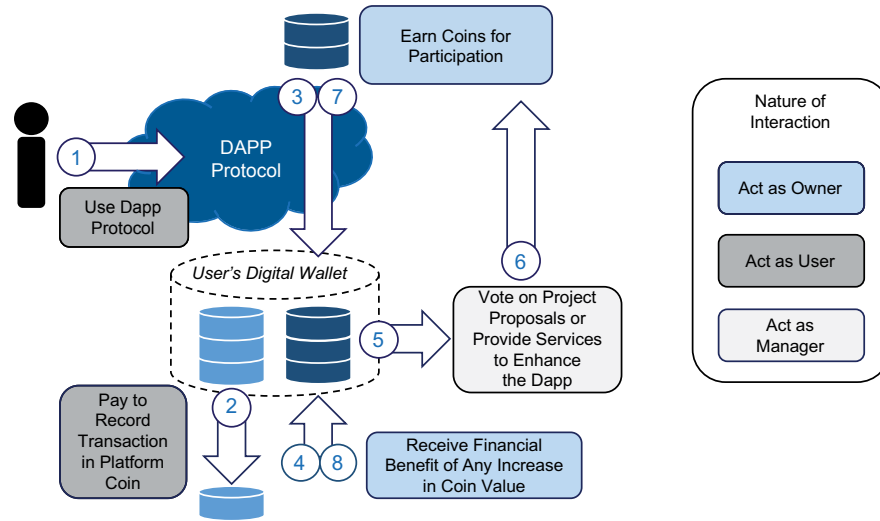
Indeed, several survey participants noted that there are starting to be "token economic valuation models" that can inform investor decisions around these types of offerings, much in the way that an active manager may assess a company's fundamentals.

There are several aspects of these proto-companies that are quite different than a traditional company, making these DAOs unique offerings in today's financial ecosystem. These include the following:

- **Participation Rewards:** Users that provide resources in order to utilize the services offered by the Dapp are given governance tokens as a reward for having helped to support the community. For example, Uniswap is a decentralized exchange that operates on the Ethereum blockchain. Users that provide liquidity in certain pairs (e.g., ETH/DAI or ETH/USDT) are gifted UNI governance tokens. When the DAO was launched and the UNI coins were released in September 2020, all individuals that had ever previously utilized Uniswap were airdropped 400 UNI tokens.<sup>6</sup>
- **Majority Rule Governance:** All decisions about how to manage the Dapp are run through the DAO and any decision that obtains a 51% vote is

6 "Introducing UNI", Uniswap, September 16, 2020, <https://uniswap.org/blog/uni/>

**Chart 2.4: How Governance Tokens Enable Individuals / Institutions to Be A User, Manager, & Owner in Proto-Companies**



Source: Citi Business Advisory Services

implemented. There is no CEO, no Board, and no executive team. Voting and providing certain beneficial services to the DAO also earns those that participate a reward in the form of more governance tokens.

- Network Effects:** The issuance and awarding of governance tokens creates a flywheel phenomenon. Those that participate in the services of the Dapp or the running of the DAO are rewarded and the value of those rewards go up as more people utilize the Dapp or help in the governance of the DAO. Individuals are incented to continue to engage because the value of their rewards appreciate. In this way, DAO tokens create network effects for the Dapps that they supervise.

These proto-companies thus offer individuals an opportunity that has no parallel in the traditional financial world. They are *simultaneously a user, manager, and owner* of the proto-company. This novel approach to stakeholder engagement is shown in Chart 2.4.

***“In DeFi I don’t need to know who I’m trading with or trust them. I just need to know that I can trust the system to do what it is supposed to do.” - Citi***

***“I think organizations will be DAO-operated. We will not be working for companies; we will be working for a DAO.” - Blockchain / Crypto firm***

***“You can say you want to be a facilitator and create a forum and a budget request that goes through a vote. If the vote passes, the system will implement a smart contract to pay you every single month and you don’t rely on anyone else.” - DeFi Protocol***

### **New Technology Approach and Mindset Enables Revolutionary Shift in Delivery of Financial Services**

Technology innovation is an ongoing endeavor, but only rarely is there a paradigm shift in approach. The move from mainframe and server-based infrastructures to cloud-based infrastructures that enabled the use of unstructured data and development of artificial intelligence (AI) tools was one such evolution. In tech speak, Web 1.0 was built on the first model and Web 2.0 was built on the second.

What is happening now in the crypto domain is the emergence of Web 3.0. Models being tested via real-time proofs-of-concept in the crypto domain represent as consequential a shift and provide a glimpse of how the financial infrastructure of the 2030’s may be constructed.

### **The Power of a Single Language and Single Platform**

A variety of developer-focused blockchains like Polkadot, Avalanche, and DeFinity have emerged over the past several years, widening the potential of institutional adoption. However, Ethereum’s role as the



“center of gravity” for Dapp and activity in the decentralized finance space has led to an acceleration of adoption and utility with this new technology toolkit.

One of the biggest advantages today in DeFi is that much of this innovation is taking place on a very small number of platforms. The result of this development concentration is that everyone is building in the same languages and off the same templates. For example, many smart contract developers use Solidity and Vyper for coding languages and rely on the ERC-20 token standards when creating their Dapps.<sup>7</sup>

Dapp developers use a common code base and the code is openly available to any participating developer. This means they can pull extracts of code from a shared library which is available to the entire ecosystem to ensure a consistent approach in development. The most commonly reused code become the de facto atoms and “building blocks” of the crypto ecosystem that developers combine to build new capabilities. For example, the code to “transact” which means to match a buyer and seller, can be written once within the ecosystem and then used by all the developers. These smallest fragments of algorithmic code are called **primitives**.

### Protocols Explained

Primitives are then combined to create protocols. Protocols are a basic set of rules and procedures that allow data to be shared between computers. Protocols are the foundation on which the internet is built, and anyone using the internet or email uses them every day, often without knowing.

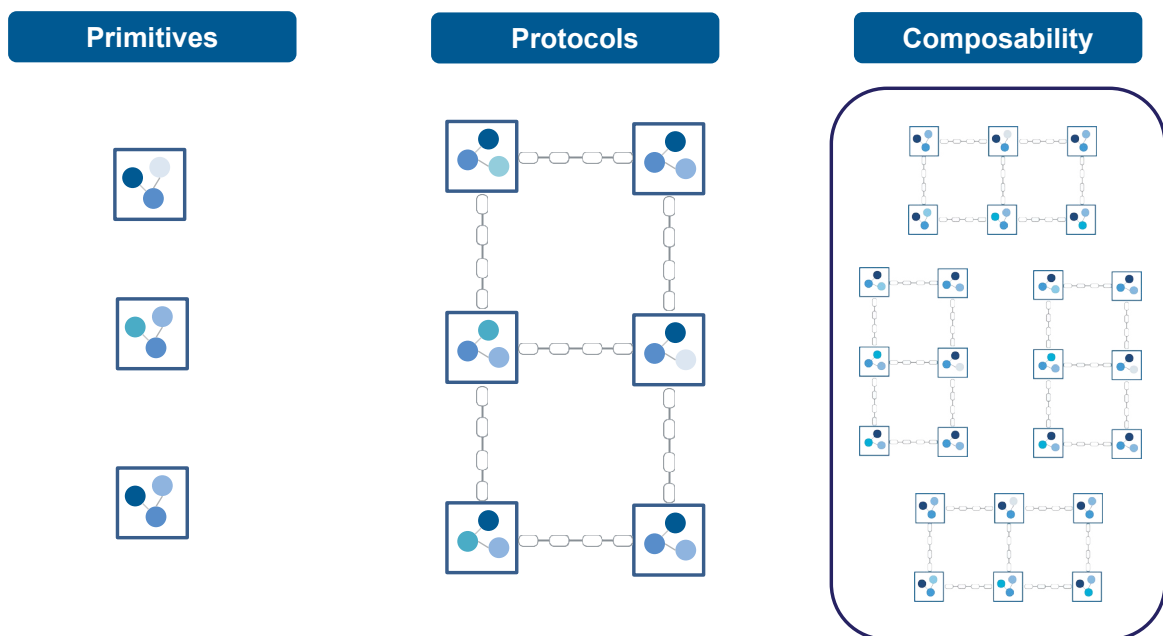
For example, the ‘http’ at the beginning of every URL stands for Hyper Text Transfer Protocol, referring to a string of code which instructs a computer to “call this website”. SMTP stands for Simple Mail Transfer Protocol and enables mail to be routed between senders and recipients. TCP/IP or Transmission Control Protocol/Internet Protocol enable computers to be networked and communicate with each other across the internet.

Http was the foundation of what is often referred to as “Web 1.0”, when users could only search for information and read it but not generate information or create content. This can be thought of as the read-only web where users only consumed content. “Web 2.0” was the read-write web where users could read and search as well as create and publish content to the internet. In today’s world when an individual uploads content to a site like YouTube, the code that enables that upload is a Web 2.0 protocol that interacts with the Web 1.0 protocols discussed above to make sure that the content makes it to the web and to the site it is intended to be hosted on.

Today, increasingly sophisticated cryptographic primitives are being combined to form new protocols. Cryptocurrency protocols describe the rules and procedures for operating in a decentralized network and are more advanced than the earlier Web 1.0 and 2.0 protocols.

Rather than just encompassing a discrete function (e.g., connect, route, communicate, upload) they are able to wrap an entire series of processes together and create an end-to-end service as a single protocol (e.g., accept collateral submitted to a lending pool; create

**Chart 2.5: Understanding Primitives and Protocols and their Implications for Composability**



Source: Citi Business Advisory Services

7 “Best Programming Languages to Build Smart Contracts”, Toshendra Kumar Sharma, Blockchain-Council, Accessed May 4, 2021, <https://www.blockchain-council.org/blockchain/best-programming-languages-to-build-smart-contracts/>

a contract to pay the contributor interest on the submitted amount; set up a deposit arrangement to the contributor's wallet).

The crypto domain protocols that enable these more sophisticated processes allow computers to talk to each other and execute these multi-stage activities *independent of human interaction*. Moreover, because they are created using a single programming language, they can be linked together to create even more complex interactions.

There are many different types or protocols in the crypto ecosystem that can deliver anything from borrowing and lending to acting as automated market makers. The protocols that people build are universally accessible and can be combined with each other to enhance existing protocols or create entirely new capabilities. This element of *composability* is the foundation for innovation in DeFi. It is allowing innovation to occur at an exponential pace, with an almost infinite number of possible combinations and permutations of protocols available to create new services and products. This is illustrated in Chart 2.5.

The potential application of these more advanced protocols, and intersection of the internet with other technologies like Artificial Intelligence and Natural Language Processing is ushering in a new era, creating "Web 3.0".

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***"When it comes to protocols, and DeFi products more generally, in 5-10 years, you won't build a new stack to start trading a new product; you'd get regulatory approval to leverage an existing stack. It's like how in the mid-90s everyone built their own CRMs which was a tremendous waste of money." - Consultant***

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***"In DeFi, participants are all paid a fair share for doing what they are doing. There are early adopters using the protocol and the developers really have to care about what their communities think because if they don't people can just take their code and create something better." - Retail Investor***

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***"DeFi is about enabling mixing and matching of code to create better processes and new applications. It is impossible to keep track of the use cases because of the composability of applications. Over time they will bubble up and the best of the best will win." - APAC Investor***

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## How Protocols are Being Used to Create New Financial Opportunities

Bitcoin was the first crypto protocol and it was meant to function as a payment system. A much broader set of protocols have since emerged focused on a growing number of activities within the financial realm. The creation of these protocols together with the composability of the functions and the fact that they can operate without human intervention is creating a whole new ecosystem, allowing for the emergence of the "fin-dividuals" described in Section I. Collectively, this emerging investment space is known as Decentralized Finance (DeFi).

Decentralized autonomous financial networks are able to deliver a range of traditional financial outcomes and services, as well as entirely new ones. Some popular models have emerged, that not only emulate many traditional financial functions, but also begin to build out new capabilities and extend interactions to individual investors that were once only available to institutions.

Two broad categories of DeFi models have emerged: those that reflect new ways of **trading assets**, and those concerned with new ways of **creating assets**. For a more detailed understanding of these models, please see the related Appendix Glossary section of this report.

### Trading Assets: Emerging DeFi Models

- **Lending and Borrowing:** These functions in DeFi are similar to those in traditional finance, with the notable exception that there is no central intermediary. In these peer-to-peer transactions, the smart contract acts as the intermediary and holds all collateral until the loan term has ended. Lending in the DeFi space is usually significantly over-collateralized (often 200%+) to account for the volatility of the associated cryptocurrencies. This helps to dampen counterparty risk.<sup>9</sup>

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<sup>9</sup> "DeFi Lending and Borrowing Explained", Coin Telegraph, Shiraz Jaghati, January 18, 2021, <https://cointelegraph.com/explained/defi-lending-and-borrowing-explained>

- **Automated Market Making:** Market-making is one of the more popular operating models in DeFi which involves creating a market through the use of liquidity pools. Nearly anyone can become a liquidity provider, and providers are incentivized to put unique tokens, coins, or assets in the pool to help improve liquidity in less liquid markets.<sup>10</sup> These protocols sometimes also distribute a separate token which can appreciate in value in line with the model shown back in Chart 2.4.
- **Yield Farming:** Yield Farming, sometimes referred to as liquidity mining, is a popular strategy in DeFi where users deploy and constantly redeploy crypto assets in different protocols with the goal of maximizing returns, which could come as interest, fees, or inflationary rewards. Yield farmers will actively move their crypto around the DeFi ecosystem in search of higher yields.<sup>11</sup> Similar to what occurs in automated market making, protocols sometimes distribute a separate token to providers of liquidity and this token has the ability to appreciate in value.
- **Staking Pools:** Staking is another form of transaction verification process, similar to Proof of Work (PoW) but instead of solving a cryptographic problem, trust in the verification process is created by having those engaged in checking transactions put up their own coins as collateral, receiving interest on their stake if they remain reliable, and forfeiting their stake if they fail to adequately affirm the transactions presented to them.<sup>12</sup> A new type of staking pool has emerged as a way for investors to participate in the interest being earned by staking. Staking pools, or staking-as-a-service providers, play the role of a bank, adding investors' money to their stake and sharing the combination of transaction fees and inflationary rewards by acting as a node in verification networks.
- **Flash Loans:** These loans are hyper-short term loans that give borrowers access to uncollateralized loans, provided they return the capital within one transaction block of the blockchain. Loans are usually taken out and repaid within a few seconds. This unique product can allow participants to take advantage of fleeting arbitrages across different market places cheaply and with no collateral.<sup>13</sup>
- **Synthetic Assets:** Similar to traditional markets, DeFi providers have started offering synthetic assets with exposure to various cryptocurrencies like BTC and ETH, and even mainstream stocks like Google and Tesla. To achieve this exposure,

users will purchase synthetic coins that represent a multiple of the dollar value of the underlying asset. This difference between the dollar value of the synthetic coins purchased can be more than 6x of the dollar value of the underlying asset, offering leverage in the system.<sup>14</sup>

- **Prediction Markets:** While these markets have existed for some time to enable participants to trade on the potential outcome of an event, cryptocurrencies and DeFi have revitalized the concept with their decentralized operation enabling far wider participation with fewer restrictions and lower fees.<sup>15</sup>

### *Creating Assets: Emerging DeFi Models*

The activities we have explored thus far, and their related tokens and coins, are considered fungible tokens, their identical nature and interchangeability meaning that one could be seamlessly substituted for another and the holder retain the same rights and exposures.

Non-fungible tokens or "NFTs" are also growing strongly. We will explore NFTs and the implications of their potential use cases in more detail in Section III. However, they are notable in the current context of emerging DeFi models as they represent a new form of issuance and tokenizing assets.

- **Non-Fungible Tokens (NFTs):** NFTs are tokens that represent the ownership of a unique digital asset and register that ownership on the blockchain, even while the digital asset itself remains in circulation and publically accessible. They offer a way for an individual to create a unique asset, and enable buyers to purchase it with an assurance from the issuer that the asset itself remains unique. In addition to registering the token, many NFTs include smart contracts that define the rights of the maker and the buyer of the token. Such rights can include royalties, shares of resale value, or special perks like front row seats at a concert.

This extensive catalogue of new technologies, coupled with a cultural overlay of decentralized collaboration and cooperation is leading to a sea change in how, where, and why innovation occurs.

Whether one believes in the investment potential of these new marketplaces or not, it is important to understand that developments in the crypto domain and DeFi space represent an unprecedented period of innovation for the financial services industry, pushing the boundaries of what is possible and extending investment options to individuals that had previously

<sup>10</sup> "What are Automated Market Makers?", Cryptopedia, March 14, 2021, <https://www.gemini.com/cryptopedia/amm-what-are-automated-market-makers>

<sup>11</sup> "What is Yield Farming in Decentralized Finance?", Binance Academy, Accessed May 4, 2021,

<https://academy.binance.com/en/articles/what-is-yield-farming-in-decentralized-finance-defi>

<sup>12</sup> "Staking and Inflation", Coinbase, Accessed May 4, 2021, <https://help.coinbase.com/en/coinbase/trading-and-funding/staking/staking-on-coinbase>

<sup>13</sup> "Aave, Flash Loans, What are Flash Loans?", Accessed May 4, 2021, <https://aave.com/flash-loans/>

<sup>14</sup> "What is Synthetic and How Does it Work?" Kain Warwick, Cryptopedia, December 10, 2020, <https://www.gemini.com/cryptopedia/synthetic>

<sup>15</sup> "How Crypto Transforms Prediction Markets", CoinDesk, Alyssa Hertig, Feb 18, 2021, <https://www.coindesk.com/how-crypto-transforms-prediction-markets>

only been available to institutions, thus helping to enable the “fin-dividual” as a new investment persona.

What emerges from this petri dish of innovation may be far more disruptive than anything emerging from prior FinTech experiments. Transformations may occur not just at the individual level and not just within the financial realm, but potentially across the economy as a whole. Issues that have arisen around how to value companies that rely more on intangible as opposed to tangible assets and concerns about the balance of economic power between digital platforms and their customers may find new solutions as a result of experimentation in the crypto space.

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***“I think the automated market maker concept is the most fascinating thing that has come out of DeFi. The automated market maker is much more transparent. This is the newest innovation.”***  
***- Blockchain / Crypto firm***

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***“DeFi reminds me of the ICO space 3 years ago. There is significant promise and the technology innovation is fantastic, just look at Uniswap volumes. We are definitely going to see DeFi play a bigger role in finance, but there are some risks that still exist.”*** - Blockchain / Crypto firm

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## Section III: Crypto Experimentation Offers Glimpses of NewFi, Enhanced Creator Economy

While financial industry participants may observe developments in the crypto domain as an interesting source of innovation and experimentation, there is a sense that these models pose little threat to the broader investment world. At best, interviewees viewed them as thought provoking and topics for future investigation, and in many instances survey participants were outright skeptical and dismissive of developments in the space.

Yet, there are known problems in the existing investment landscape that have no easy answers. Foremost among these concerns is the growing shift in how companies are creating value and how to measure the new sources of impact. A clear migration in company value from tangible to intangible assets is underway, but today's approach to measuring intangible asset values falls short. In addition, there are a growing number of intangible assets that are purely digital and the frameworks for evaluating the economic impact of those variables are either overly simplistic or missing entirely.

The societal aspects of how the new economy is unfolding are also a concern. We are in the midst of a burgeoning creator economy. Many of the digital assets and interactions driving value and creating the data to feed the development of algorithms and network growth originate from individuals. The balance of economic power between these individuals and the companies reaping the benefit of their energies is skewed with little direct income accruing to those that are driving engagement.

Developments in the crypto realm, particularly the DeFi and NFT models being experimented with at present, may offer templates and lessons for unlocking the value of these digital assets and re-balancing the allocation of economic value between individuals and companies in ways that could be beneficial to both. Application of these models may create version 2.0 of the creator economy and lead to the emergence of a completely new financial ecosystem which we dub NewFi.

Understanding the importance of intangible assets and how the overall assignment of value has changed in the traditional financial realm is a good starting point to lay the foundation for why radical new approaches may be required.

### Intangible Assets Drive a Growing Share of a Company's Value and Changing Relationship with their Underlying Consumers

Historically, companies' balance sheets consisted primarily of tangible, physical assets, including property, plant, and equipment (PP&E), as well as cash or inventory. These assets are measurable, and can be valued according to a set of anticipated economic benefits generated by the asset over the course of a finite economic life. Metrics such as capex assess the extent to which a company is funding improvements in its existing infrastructure or undertaking expansionary initiatives, both of which acted as signals on the company's growth potential.

### Shift from Tangible to Intangible Assets in the Services Economy

In 1975, over 80% of the S&P 500's market capitalization was comprised of tangible assets<sup>1</sup>. However, against an accelerating shift towards a services-based and knowledge-driven economy, much of the economic value created by companies has shifted and is now seen originating from intangible assets, consisting primarily of goodwill, brand equity, intellectual property (including patents, trademarks and copyrights), licensing, customer lists, and R&D.<sup>2</sup> At present, approximately 90% of the S&P 500 market capitalization is considered to originate from these intangible sources.<sup>3</sup>

Such intangibles are not directly measurable and there are significant limitations in how well current accounting approaches and associated valuation treatments capture these assets. Numerous metrics used to value companies historically have become obsolete - for example, looking predominantly at capex investment is no longer a reliable gauge of corporate value. Typically, intangible assets are valued by subtracting book value from market value, which often results in measurements that are considered, at best, imprecise.

1 "As Intangible Assets Grow, So Does The Role Of ESG Standards", Martin Jarzebowski, Forbes, December 29, 2020,

<https://www.forbes.com/sites/forbesfinancecouncil/2021/12/29/as-intangible-assets-grow-so-does-the-role-of-esg-standards/?sh=3894476e4d44>

2 "Intangible Assets List, Madhuri Thakur", Wall Street Mojo,

<https://www.wallstreetmojo.com/intangible-assets-list/>

3 ibid

Furthermore, according to GAAP, intangible assets are only recognized on the balance sheet if they have resulted from an acquisition and can be attributed a measurable value and lifespan, such that they can be amortized. Therefore, internally-developed assets such as unique data processing algorithms—whether of external market intelligence, customer behaviors, or the efficiency of internal operations—are not captured on the balance sheet, at a time when it is exactly these type of unique differentiators that are becoming critical for establishing franchise value and informing company's growth potential.

A significant disconnect is emerging between the intrinsic value of those companies and how investors currently assess this value. The gap is widening as a larger proportion of assets become subsumed under the intangible category. This trend is creating a need to fundamentally re-evaluate the key drivers of corporate value creation and update the industry's valuation methodologies, which are failing to appropriately capture those growing value pools.

### **Broadening Set of Digital Intangible Assets Fall Outside Traditional Considerations**

This requirement is further augmented by the fact that intangible assets are expanding to encompass a broader set of assets. The more traditional intangible assets discussed above can in a sense be thought of as *analog intangibles*, serving to capture the sources of corporate differentiation and intellectual property ("IP").

As more of a company's activities and an individual's lives are spent connected to networks, platforms, and clouds, another type of *digital intangible* asset is being created. To put it in perspective, the U.S. Bureau of Economic Analysis ("BEA") estimates that in the U.S., the digital economy has grown at an average rate of +6.8% between 2006 and 2018 whereas the overall U.S. economy grew at just +1.7% during the corresponding timeframe.<sup>4</sup>

The gap may even be larger as many contend that the U.S. BEA's definition of the digital economy (consisting of the information and communications technology infrastructure, e-commerce, and digital services for computing and communications), severely underestimates the size of the digital economy. This framework does not include finance and professional, scientific, and technical services, where a large and growing proportion of activities are being carried out digitally.<sup>5</sup>

The MIT Digital Economy initiative estimated that from 2004-2019, U.S. consumers had derived \$231 billion in value from Facebook alone, but that U.S. GDP metrics

had captured only a part of that by measuring solely the value obtained through advertising revenues.<sup>6</sup> This resulted in undercounting an average of 0.11 percentage points a year that might have been added to U.S. GDP growth.<sup>7</sup>

One of the reasons for this mismatch is due to the changing role of data. A company's data footprint is becoming an increasingly important part of their operations. The digital economy generates data across nearly all interactions from activities performed by employees as part of their day to day responsibilities to coordination with supply-chain and distribution partners to customer transactions and engagement. This data can be used to analyze consumer behaviors, create better or new products, and develop partnerships with ecosystem participants.

Companies are harvesting and using this data to create completely new forms of IP. These digital intangibles are unique to the company and difficult for competitors to emulate since the underlying inputs are based on the exhaust of each organization's own activities. Digital intangible IP in essence forms a moat around a company.

What is important to note is that this is not just a "new" economy phenomenon. This is happening with traditional companies as well and is a by-product of the shift from mainframe-based to cloud-based operating infrastructures that allow for easier harvesting of data and that offer up more effective data modeling tools. It is also the result of the massive datafication of daily life being created by mobile phones, electric cars, smart devices, and more that are constantly creating and sharing geolocation tags, sensor data, and network information.

Below, we discuss the new types of intangible digital assets that increasingly make up a company's value:

- **Proprietary Data Sets:** A company's unique data assets are seen as a critical, if not *the critical*, asset held by a corporation. Valuing this asset is a challenge even for the big technology platforms that rely on this information as the core of their business operations. For example, Facebook's advertising revenues are contingent on the extraordinary amount of data that it holds on its users. Though indirect, an attempt to measure the value of that data can be tied to the amount of advertising revenue that the company might lose if were to ever remove ads. A recent Tech Policy Institute study estimated that Facebook would have to charge a quarterly subscription fee of \$13.80 per user in North America to offset such a loss in revenues.<sup>8</sup>

4 "Toward a Digital Economy Satellite Account", Bureau of Economic Analysis, August 2020, <https://www.bea.gov/data/special-topics/digital-economy>

5 *ibid*

6 "How Should We Measure the Digital Economy?", Erik Brynjolfsson and Avinash Collis, Harvard Business Review, November 2019, <https://hbr.org/2019/11/how-should-we-measure-the-digital-economy>

7 *ibid*

8 "Here's How Much Your Privacy on Facebook Is Worth", Evan Niu, CFA, The Motley Fool, February 26, 2020, <https://www.fool.com/investing/2020/02/26/heres-how-much-your-privacy-on-facebook-is-worth.aspx>

As of Q4 2020, Facebook had 258 million active monthly active users across the U.S. and Canada.<sup>9</sup>

- *Unique Data Processing Algorithms:* To capitalize on these unique data assets, companies are developing powerful algorithms to mine data at scale and develop differentiated insights. Market leaders have built entire patchworks of intersecting algorithms, combining insights across multiple activities and sources. TikTok is famous for its “For You” page algorithm, which incorporates a large variety of signals starting with the demographics and the type of mobile device owned by the video author and adding dimensions such as whether the user watched the video in its entirety, if he or she distributed the video further and went on to “follow” the author of the video. Users are sometimes presented with videos that deviate from their historical preferences to test whether the algorithm should be updated to reflect any new interests.<sup>11</sup>
- *Unique Network Relationships:* How companies build and leverage their network relationships is another critical source of IP. There are two dimensions to this pursuit—harnessing their network effects and creating their own ecosystems.
- *Network Effects:* Nearly all organizations capture information on their consumer base and seek to utilize that data to enhance the stickiness of their relationships through marketing and branding. However, few succeed at using their network of consumers as a direct tool to amplify and create feedback loops to extend and improve their business. Organizations that do can find substantial value in these techniques. One example is Spotify’s “freemium” business model. Daniel Ek, founder and CEO, noted in 2018 that “our free product drives premium subscription growth—that leads to better personalization and drives use among younger demographics with greater potential lifetime value.”<sup>12</sup>
- *Proprietary Ecosystems:* Another new type of network relationship emerging as a unique form of IP is the ability to act as an “orchestrator” in order to drive mutual, continuous value creation. Ecosystems used to evolve around supply-chain and distribution dynamics. Today they are more organic and adaptable, looking to drive mutual value across broad

sets of participants. Amazon’s Alexa product is one example. Amazon offers its Alexa software developer kits to a large network of developers for free. By 2019, more than 50,000 skills/applications had been developed by companies ranging from Domino’s Pizza to American Express. As these developers create more and better Alexa capabilities, more customers want to utilize the offering which in turn draws new skills developers in a virtuous circle.<sup>13</sup> The Boston Consulting Group found that 83% of digital ecosystems involve partners from more than 3 industries and 53% from more than 5 industries.<sup>14</sup> Six of the world’s top seven companies by market capitalization were ecosystem companies as of August 2020, with the list including Apple, Microsoft, Amazon, Alphabet, Facebook, and Alibaba.<sup>15</sup>

- *Loyalty Programs:* Attracting not just a user base, but a “member” community is a shared benefit for both the company and the consumers that participate in the program. Some of these initiatives create points or reward dollars that exist as intangible assets until used at which time they become tangible assets able to access actual goods or services. Benefits programs are wholly intangible digital assets that can have significant impact on a company’s value. One of the best-known such programs is Amazon Prime, which had reached 200 million members worldwide by early 2021.<sup>16</sup> Being a Prime member gets the consumer several benefits including free shipping or access to a library of free digital content. Significant value also accrues to Amazon. Once consumers become Prime members, they are unlikely to cancel their membership, with 93% of consumers keeping their membership after the first year.<sup>17</sup> In the U.S., Prime members spent almost \$2,000 on the Amazon platform in 2020, over four times as much as non-Prime members. Moreover, Prime members were twice as likely to first search for products on Amazon rather than a different search tool.<sup>18</sup>

The contribution of this set of intangible digital assets is significant, but is not captured on the balance sheet in any meaningful way, due in part to difficulties valuing them.

As more individual and business activities shift to the digital realm, this issue is likely to have a growing

9 “Number of monthly active Facebook users in the United States and Canada as of 4th quarter 2020”, H. Tankovska, Statista, February 2, 2021, <https://www.statista.com/statistics/247614/number-of-monthly-active-facebook-users-worldwide>

10 “The Creator Economy Needs a Middle Class”, Li Jin, Harvard Business Review, December 17, 2020, <https://hbr.org/2020/12/the-creator-economy-needs-a-middle-class>

11 *ibid*

12 “Internet Trends”, Mary Meeker, BOND, June 11, 2019, <https://www.bondcap.com/report/itr19/>

13 “The Emerging Art of Ecosystem Management”, Nikolaus Lang, BCG, January 16, 2019, <https://www.bcg.com/publications/2019/emerging-art-ecosystem-management>

14 *ibid*

15 “Ecosystem 2.0: Climbing to the next level”, Violet Chung, McKinsey, September 11, 2020, <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/ecosystem-2-point-0-climbing-to-the-next-level#>

16 “Amazon Prime reaches 200 million members worldwide”, Digital Commerce 360, April 16, 2021, <https://www.digitalcommerce360.com/article/amazon-prime-membership/>

17 *ibid*

18 “Prime has never been more important to Amazon”, Marc Bain, Quartz, May 3, 2021, <https://qz.com/2004369/the-pandemic-made-prime-even-more-valuable-to-amazon/>

impact. The gap between today's methodologies and the emerging reality is likely to be further magnified. The problem becomes compounded when the issue of the company's relationship with its consumers comes into consideration.

***“There’s a big difference between what a company reports on itself and what is actually going on in the company and I think with these technologies we will be able to get to this point.” - Global Asset Manager >\$1 trillion AUM***

***“We don’t have as many tangible assets today as we used to. Finance today is very much digital. Tokenization is just a representation of that. There is a value in the digital experience and having those digital assets.” - EMEA Asset Manager <\$500 billion AUM***

***“In a pandemic world, people are going to find value in places that they wouldn’t have looked to previously. There is value ascribed to intangible things.” - Consultant***

**Consumers Drive New Models of Digital Asset Creation But Only Partially Share in the Benefit**

In addition to the assets developed in-house, many companies also rely on assets being contributed to company platforms by individual users. The advent of the sharing economy over a decade ago was premised on individuals providing access to their own physical goods such as homes, or to services such as rides. Individuals provided the assets sold by these platforms and managed those

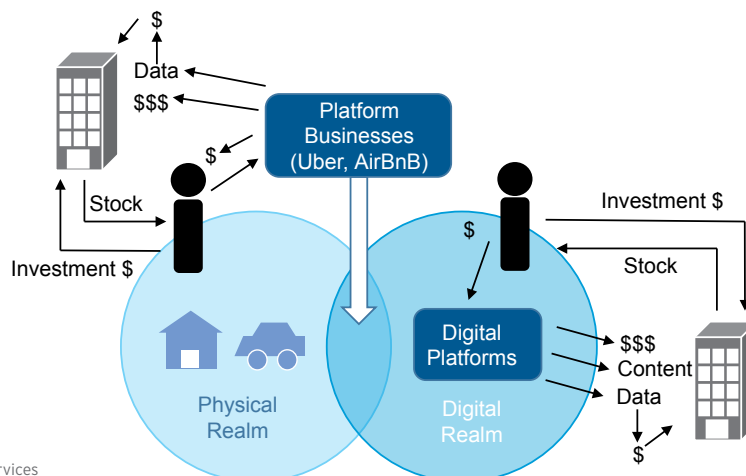
assets on behalf of the company. This is the Airbnb model wherein regular individuals rent out their home but also act as property managers for the asset they monetize via the corporate platform.

Over time, this model evolved into individuals creating digital assets to share, primarily in the form of online content delivered via the internet. This trend spans multiple content types—long-form videos (e.g., YouTube), short-form videos (e.g., TikTok or Instagram Reels), photos (e.g. Pinterest), podcasts (e.g., Stitcher), music (e.g., Spotify), games, (e.g., Roblox) and wide varieties of written content from blogs to online newsletters (e.g., Substack). Platform users thus became not only consumers, but content contributors and creators. Both models are illustrated in Chart 3.1.

Individuals’ contributions to a platform can be considered another form of *digital intangible assets*. For platform businesses that rely on physical assets to fulfill their services, there are fairly straightforward ways to value individual’s contribution to their model. For example, at the outset of 2021, Airbnb had 2.9 million hosts and 7 million listings across 100,000 cities on their platform. For each, their model looks at the average number of guests per listing, the number of listings, the average rent per guest, and Airbnb’s share of the profits.<sup>19</sup> From that formula, they can thus determine the value of each asset and the amount that they will pay each contributor.

Valuing the content-based digital assets being contributed by individuals that drive engagement as opposed to services is not nearly as straightforward an exercise, however. At present, the only measure available to evaluate the relative worth of these assets is “virality”. As platforms seek for their content to be distributed broadly at a fast clip, they are investing more in word-

**Chart 3.1: Individual Contributors Enable Growth of Digital Platforms & Businesses**



Source: Citi Business Advisory Services

<sup>19</sup> “2021 Airbnb Statistics: Usage, Demographics, and Revenue Growth”, Steve Deane, Stratos, January 26, 2021, <https://www.stratosjets.com/blog/airbnb-statistics/>



of-mouth marketing and seeking to attract or engage with social influencers who can rally large bases of followers. The rise of certain social influencers is instructive. For example, Charli D'Amelio became the first TikTok creator to surpass 100 million followers for her dancing videos at the age of 16, and was estimated to be worth \$4 million.<sup>20</sup>

This level of success is definitely the exception, however, rather than the rule. While a few top influencers attain significant earnings, they tend to be outliers. Achieving virality is extremely difficult according to the thresholds set by these platforms. For example, on YouTube, an individual needs a minimum of 1,000 YouTube subscribers and 24 million yearly views to generate \$100,000, while on TikTok he or she would need a minimum of 10,000 TikTok subscribers and over 270 million views a year to generate \$100,000.<sup>21</sup> An analysis by HBR found that Spotify artists would need 3.5 million streams annually to earn the equivalent of the annual minimum wage of \$15,080.<sup>22</sup>

Moreover, these payouts do not include any consideration of the benefits that the platform can derive from these assets and the engagement around them. Creators do not participate in the revenue streams that the platforms generate by harvesting and selling their data or in the advertising revenues that are typically linked to the content they deliver and consume. Indeed, the only path for creators to capture this platform value is through buying stock in the company—thus contributing not only their assets and time, but their capital as well. “Fin-Dividual” investors, as introduced in Section I, represent a parallel evolution of this model seen in the creator economy.

For now, this situation is worth noting, but it is not creating much in the way of backlash. Consumers benefit from the social aspects of engagement and from the more tailored recommendations companies create using their data. These are considered sufficient incentives for the vast majority. A 2019 survey found that over a third of children in the U.S. and the U.K. would like to become vloggers or YouTube influencers whereas only 11% expressed a desire to become an astronaut.<sup>23</sup>

Yet, as discussed in Section II, the crypto domain is experimenting with new models of incenting participation that more evenly distribute the wealth accumu-

lation between the platform and the creator and that enable the direct ownership of digital assets without affecting their ability to go viral. If attitudes about the ownership and compensation model for these types of digital assets shift, the sheer number of creators and size of the digital platform economy's library could prove to be fertile ground for a re-working of the rules of the creator society.

According to a 2019 Pew Research Study, YouTube had 44,000 channels with a minimum of 250,000 subscribers each.<sup>24</sup> These channels amounted to almost 50,000 hours of uploaded content, drawing over 14.2 billion individual views in one week.<sup>25</sup> The importance played by YouTube in Americans' lives was also on the rise with almost 75% of Americans using YouTube and half of U.S. adult users of YouTube viewing it as very important for learning how to do something new.<sup>26</sup> Spotify recently noted that its platform has “8 million creators, and hundreds of millions of pieces of content”.<sup>27</sup>

If given a pathway, these individuals may begin to demand a more equitable arrangement. While the transition to a “creator” economy is often purported, platforms have largely failed to link individuals' contributions to their network value and though consumers are incented with social connections, digital rewards, and in some cases financial payouts, their ability to extract the full value of the assets and time they contribute has been limited. Models emerging from the crypto domain may provide a new way to rebalance that equation.

## Crypto Models Offer Potential Ways to Unlock Digital Asset Value for Both Individuals and Companies

Developments in the crypto space may offer new opportunities to address both problems presented thus far—the current methodologies used to value a company's intangible digital assets and how those companies that rely on consumer provided content and interactions value their customers. This might allow companies to properly account for their full set of tangible and intangible digital assets and enable a more equitable sharing of economic value between platforms and contributors.

20 “The Creator Economy Needs a Middle Class”, Li Jin, Harvard Business Review, December 17, 2020,

<https://hbr.org/2020/12/the-creator-economy-needs-a-middle-class>

21 “Here's how many social media followers you need to make \$100,000”, Jade Scipioni, CNBC, April 20, 2021,

<https://www.cnbc.com/2021/04/30/how-much-money-you-can-make-off-social-media-following-calculator.html>

22 “The Creator Economy Needs a Middle Class”, Li Jin, Harvard Business Review, December 17, 2020,

<https://hbr.org/2020/12/the-creator-economy-needs-a-middle-class>

23 “American kids want to be famous on YouTube, and kids in China want to go to space: survey”, Paige Leskin, Business Insider, July 17, 2019,

<https://www.businessinsider.com/american-kids-youtube-star-astronauts-survey-2019-7>

24 “10 facts about Americans and YouTube”, Patrick Van Kessel, Pew Research Center, December 4, 2019,

<https://www.pewresearch.org/fact-tank/2019/12/04/10-facts-about-americans-and-youtube/>

25 ibid

26 ibid

27 “Joe Rogan addresses his controversial anti-vaccine comments”, Kerry Flynn, CNN, April 29, 2021,

<https://www.cnn.com/2021/04/29/media/joe-rogan-clarifies-vaccine-comments/index.html>

In a sense, the DeFi engagement model and the template being explored with NFTs may emerge as the two most successful experiments from the crypto domain's petri dish of innovation. Though the models may not translate directly into the broader economy, they offer proofs of concept for new ways of recognizing and unlocking value that might crossover. If so, they may provide a pathway for the emergence of a more effective iteration of the creator economy.

### **DeFi Participation Lessons and Opportunities to Earn Passive Income**

As described in Sections I and II, individuals utilizing DeFi protocols are also viewed as key contributors to the build-out of these protocols and can earn passive income by joining DeFi networks. As noted earlier, individuals are not only the *users* of the network, they also become *owners* of the network in the economic sense through participatory rights in the financial upside of the network, and *managers* of the network with a say in the evolution of the protocol via governance tokens. These activities are able to earn individuals passive income through a variety of activities that include:

- **Sharing Views:** As described in Section II, decentralized autonomous organizations (DAOs) have emerged as a form of governing on-chain proto-companies through the use of smart contracts and code. The DAO takes in information external and internal to the network which then feeds into self-executable commands, thus enabling the DAO to operate in a decentralized fashion. The DAO's governance rules are all stored transparently on the blockchain. Individuals that own tokens for these governance protocols can vote on proposals about the evolution of the network and if that proposal passes the network's consensus rules, it is operationalized. Participants that vote are rewarded with additional governance tokens that entitle them to a share of the economic appreciation of the network and are therefore incentivized to contribute to its growth. One example is the MakerDAO protocol which provides a stablecoin tied to the U.S. dollar called DAI. Maker token holders can vote on issues relating to DAI including adjusting the interest rate charged for the DAI stablecoin, selecting collateral types, and refining the consensus mechanism.<sup>28</sup>
- **Sharing Skills:** Individuals can also earn tokens, analogous to a commission or a salary, by performing certain functions or helping implement initiatives related to improvements in the protocol.<sup>29</sup> Protocols such as Compound award grants to sponsor improvements to the network. While the majority of the individuals helping to build these protocols in the early years were developers, the set of participants now supporting var-

ious protocols are expanding as more mature protocols require individuals to help with a variety of tasks from administration to marketing to talent recruitment. This build out of a more robust ecosystem of contributors beyond developers is part of why many observing the crypto domain are beginning to view these protocols as proto-companies.

- **Sharing of Resources:** Just as homeowners share their properties on Airbnb, there are also starting to be decentralized networks where individuals can share other types of resources and receive direct compensation. One example is the Helium network that is looking to create a decentralized wireless infrastructure to help power the internet of things (IoT) by getting individuals to run Wifi hot-spots from their home routers. Those running the nodes will be validated as providing Proof of Coverage (PoC) and be compensated via the issuance of tokens for their contribution to the network.<sup>30</sup>

While all of these models are decentralized, and aspects of them are somewhat novel, they are not unrecognizable. Incenting those that contribute to the growth of an enterprise is a well-established strategy. Many companies issue stock options to high performing employees or carve out a portion of the company's ownership to be shared with the employee pool. Not only do these actions recognize the contributions of these individuals, they also help to ensure that they continue to deliver over time so that the enterprise grows and the value of those options and shares appreciate.

The lesson that can be taken away from the DeFi experiment is that by broadening the qualifications of who participates in such incentives beyond employees to all individuals that interact or engage with the company allows for a new dynamic to emerge. It mutualizes the value that is being created and draws those within the network to offer more of their views, skills, and resources to the benefit of all.

Companies may find that they are able to engineer a network effect that far surpasses the impact of loyalty programs. Moreover, the self-driving nature of the approach could tap into the wisdom of the crowd, helping to spur innovation from far more sources than employees alone might be able to offer. More individuals would be thinking about how to enhance the company in order to improve the value of their stake. In this way, the company could create and orchestrate its own ecosystem. Some may even choose to adapt the voting aspect of the DeFi governance model to let those in the community have a say in the future direction of the company, investing them even more deeply in the company's success.

<sup>28</sup> MakerDao, <https://makerdao.com/en/governance>

<sup>29</sup> *ibid*

<sup>30</sup> Helium, <https://www.helium.com/>

Companies choosing to operate in this manner that rebalances value creation to be more widely shared may find that their proposition draws talent, consumers, and assets away from ecosystems that do not offer equivalent incentives.

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***“What I would add, is part of the big power of crypto is the convergence of the user and the owner. I no longer have to be just a customer. I can buy a coffee from Starbucks but wouldn’t I be more incentivized to use it if I owned a piece Starbucks? We’re seeing the power of the crowd and combine that with the user/owner mentality and you have something that’s on steroids.” - Blockchain / Crypto firm***

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***“We have never had a network or marketplace where you can build supply side first before there is even demand. It’s okay because the incentive model rewards you while the demand side catches up. The next Uber will be founded with this model.” - Alternative Asset Manager***

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***“It is much more than just blockchain. The real question we have to answer is how we value the intangible assets. A lot of the value that is created in the world today is intangible.” - Consultant***

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### ***NFTs as a Proof Point for Re-envisioning and Attaching Ownership to Unique Digital Assets***

The other experiment emerging from the crypto domain relates to the nature and ownership of assets. Following the Christie’s auction in March 2021 where Mike Winkelmann’s (aka Beeple’s) piece entitled *Everydays: The First 5000 Days* rattled the art world when its associated NFT sold for a record \$69 million,<sup>31</sup> numerous headlines have discussed the explosion of NFTs with a significant portion of that coverage speculating on the imminent collapse of the market in what is widely viewed as a bubble. Many survey participants expressed dismay and confusion about NFTs and a lack of understanding about the value proposition. Skepticism was split between those that dismissed the trend and those that saw unanswered questions about the viability of the model.

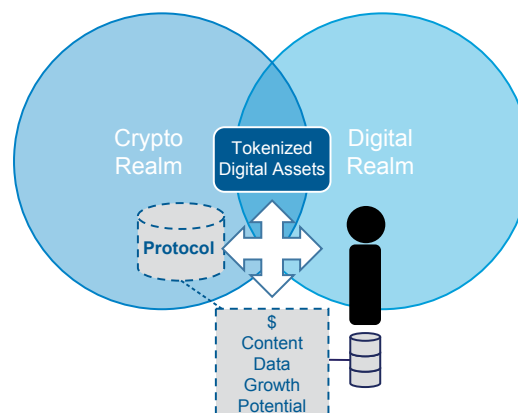
There were sometimes visceral rejections of the underlying premise behind NFTs. Commonly heard comments grouped around several common themes: How could certain assets have any value at all (e.g., Jack Dorsey’s first tweet); why would individuals pay to own something that anyone could continue to copy and download, (e.g., an NBA top shots clip) and what do you do with these assets once you own them?

There were also more tempered concerns about the viability of the offerings. Namely, survey participants wondered about how you could ensure copyright protections, what would happen to the asset if the platform hosting it were to fail and how might the discrepancy between a cryptocurrency valuation and a fiat currency valuation affect the future resale value of an asset. Indeed, Beeple himself “didn’t think twice” before swapping the ETH he received for his artwork out into U.S. dollars saying that he became “spooked” about ETH’s volatility.<sup>32</sup>

While skepticism and uncertainty is understandable, it may be important to step back and think not about the current state of play around NFTs, but more broadly about what the model represents.

As discussed earlier, there are literally millions of people creating digital assets every day with no mechanism to ensure their ownership and no ability to control or track their utilization. There is also a proven interest in individuals buying purely digital assets. In 2018, over \$50 billion was spent on in-game items. Almost 69% of all Fortnite users paid for in-game assets, spending an average of \$85 each.<sup>33</sup> The Iridescence dress, a dig-

**Chart 3.2: Tokenized Digital Assets Emerge as Bridge Between the Crypto Realm and the Digital Realm**



Source: Citi Business Advisory Services

31 “Beeple sold an NFT for \$69 million”, Jacob Kastrenakes, The Verge, March 11, 2021, <https://www.theverge.com/2021/3/11/22325054/beeple-christies-nft-sale-cost-everydays-69-million>  
 32 “Beeple Immediately Converted His \$53 Million NFT Earnings From ETH to USD”, Liam Frost, Decrypt, March 23, 2021, <https://decrypt.co/62547/beeple-immediately-changed-his-53-million-nft-takings-from-eth-to-usd/>  
 33 “The Finances of Fortnite: How Much Are People Spending on This Game?”, Mike Brown, Lendedu, June 26, 2018, <https://lendedu.com/blog/finances-of-fortnite/>

ital-only dress created by The Fabricant, a digital fashion house, brought in \$10,000 in 2019 as an NFT that consumers could “wear” only in photos.<sup>34</sup>

Section I delved into the growing sense of there being a financial opportunity gap between retail and institutional investors and noted that retail investors are looking to the crypto domain to find their own opportunities. Collectibles have long been a fascination for many individuals in the physical world (e.g., coins, comic books, and trading cards) and seeing that translated into the digital realm is not surprising.

In any collectibles marketplace, there are certain items that are worth more because of their scarcity. NFTs offer a way for this concept of scarcity to translate to the digital world. The key attribute of NFTs lies in the fact that they are a digital representation of a unique form of value. It is this characteristic that makes them non-fungible, such that they cannot be used interchangeably with another asset. Chart 3.2 shows how NFTs are creating a bridge between the digital and crypto realm, making it possible to now claim ownership of unique digital assets.

Viewed in this manner, there is likely to be a rush to move more types of collectibles into an NFT format. Major League Baseball (MLB) and MLB players announced the release of digital cards collectibles in April 2021, as the NBA Top Shot marketplace selling digital NBA game moments recorded over \$500 million in transactions in the first quarter of 2021, amounting to approximately one third of the total NFT market.<sup>35,36</sup> The music industry is also beginning to take note, with Canadian DJ Deadmau5 launching a series of 6,000 NFT packages worth a total of \$100,000.<sup>37,38</sup>

Limiting the application of NFTs to a format for delivering digital collectibles undersells the full value potential, however. Several attributes enabled by the NFT might allow for this template to be extended and become a new foundational unit for the packaging of assets. These include:

- **Traceability:** An NFT has a smart contract embedded at its core that can maintain certain rights for both the original creator and owner. The issuer continues to participate in the value created by the asset over time, which is encapsulated in the token through royalties or appreciation realized

through secondary sales. For example, EulerBeats is an NFT that contains a limited edition of music tracks that are generated by a mathematical algorithm, the parameters of which are stored in the NFT metadata. The smart contract manages the original non-fungible track and all its fungible copies. The original track’s NFT grants its owner royalty rights in the form of 8% of the print price on each print sold of the original token.

- **Embedded Rewards:** Other types of rights can also be embedded in an NFT. In addition to financial rights as noted in the example above, tokens can also embed certain non-economic rights, which are afforded exclusively to the rightful owner of the token. In the digital sphere, such rights could include special perks such as the Kings of Leon offered when they released a limited set NFT around their new album in which buyers were guaranteed front row seats at the band’s live shows for life with the enabling pass being embedded into the smart contract.
- **Connectivity/Community:** Since all the transactions are recorded on a blockchain, the issuer gets transparency through to the underlying buyer of their NFT. This could create a new type of connectivity that works to cement the “status” of certain participants within a given community. Artists, celebrities and influencers could forge a new type of relationship with their top supporters. They can know which individuals are their “super fans” and create special experiences for that subset of admirers willing to buy their NFTs. Companies can identify and market directly to the top buyers of their products, taking the concept of a loyalty program to a completely new level.
- **Interoperability:** While in its early days, there is starting to be a move to make the exchange of NFTs interoperable across platforms. Today, the NFT only exists on the blockchain where it was minted, but there are emerging efforts to allow that item to port to other chains. This might render NFTs more valuable. This is a key pursuit of the gaming industry as players would be able to buy and use assets not just in the original game, but in other games, and potentially allow players to “stake their assets from one game in another, leveraging the value of their assets without strictly migrating them from their original context.”<sup>41</sup>

34 “What is digital fashion? We spoke to a fashion house that sells digital clothing and shoes to find out”, Annabelle Williams, Business Insider, April 1, 2021, <https://www.businessinsider.com/what-is-digital-fashion-the-fabricant-nft-tribute-brand-2021-3>

35 Topps Debuts Its First Mlb Baseball Card Nft Collection with Topps Series 1 Baseball Launch”, Topps, Topps, April 12, 2021, <https://www.topps.com/blog/topps-debuts-its-first-mlb-baseball-card-nft-collection-with-topps-series-1-baseball-launch.html>

36 “Amid Slowing NFT Demand NBA Top Shot Creator Raises Capital Again, Tripling Valuation”, Nina Bambysheva, Forbes, April 20, 2021, <https://www.forbes.com/sites/ninabambysheva/2021/04/20/amid-slowing-nft-demand-nba-top-shot-creator-raises-capital-again-tripling-valuation/?sh=25618ba77611>

37 “DJ Deadmau5 Launches \$100,000 Worth of NFT Collectibles”, Liam Frost, Decrypt, December 15, 2020, <https://decrypt.co/51552/dj-deadmau5-launches-100000-worth-of-nft-collectibles>

38 “Kings of Leon Will Be the First Band to Release an Album as an NFT”, Samantha Hissong, Rolling Stone, March 3, 2021, <https://www.rollingstone.com/pro/news/kings-of-leon-when-you-see-yourself-album-nft-crypto-1135192/>

39 “NFTs can go far beyond celebrity hype”, Yves Renno, Payments Source, April 14, 2021, <https://www.paymentssource.com/opinion/nfts-can-go-far-beyond-celebrity-hype>

41 “Asset Interoperability: A Game Changer”, Citadel Herald, Gods Unchained, January 1, 2020, <https://blog.godsunchained.com/2020/01/01/asset-interoperability-a-game-changer/>

Collectively, these attributes could offer a new way for both individuals and corporations to think about their assets.

Some applications may focus on how to leverage existing assets. For example, BAND Royalty, a Singapore based company, has amassed an impressive music royalty catalog that includes artists such as Rihanna, will.i.am, Timbaland, Cher, Missy Elliot, as well as Beyonce, Jay-Z and Justin Timberlake, plus many others. In May 2021, they issued a new series of NFTs. Each BAND NFT comes with a unique three dimensional piece of art and owners are able to stake their NFTs into various BAND Royalty music pools of songs and artists, allowing them to participate in earning a share of the royalties as a music income stream.<sup>42</sup>

Other applications may focus on how to protect existing assets. For example, Louis Vuitton, Cartier, and Prada are coming together to launch Aura, a blockchain-based platform to battle counterfeit goods by issuing an NFT-based seal of authenticity for each item they produce. A buyer can access the “e-warranty” using a QR code on their mobile phone provided at the time of purchase as part of their digital receipt. Bain & Company estimates that the luxury market remains lucrative with online sales reaching \$58.9 billion in 2020, up from \$39.7 billion in 2019.<sup>43</sup> Having more sound ways to guarantee buyers that their purchase is legitimate may spur even more growth.

Perhaps the most important consideration around NFTs, however, is the ease by which they can be created. Those interested in minting an NFT need simply link their crypto wallet to an issuing platform, choose “create”, upload their digital file and then choose to add it to their wallet. On the Ethereum blockchain, the most popular dapps to enable this process are OpenSea, Rarible, and AtomicMarket. In creating the NFT, there are even options to “include special traits and attributes to increase the scarcity and uniqueness” of the NFT. Creators also have the opportunity to include unlockable content that can only be viewed by the purchaser. This can be anything from passwords to access certain services to discount codes and contact information.<sup>44</sup>

With the ability to attach ownership of an asset becoming as simple as uploading a piece of content to a social media platform, the potential to see a massive shift in individual behavior cannot be ignored.

As individuals become accustomed to participating in the value they help to create, such as through their participation in DeFi protocols, as well as through the creation of NFTs to represent a unique asset, their approach to monetizing their own differentiated capabilities as well as their economic participation in present-day corporate platforms might change. Growing awareness about alternatives to the status quo may create dissatisfaction with existing models of interaction and foreshadow new approaches.

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***“A lot of these growing pile of assets are intangibles. You can start monetizing each and every assets with the help of these protocols or NFTs.” - EMEA Asset Manager <\$500 billion AUM***

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***“I think people are going to like being associated with owning something through NFTs. They all have values and the secondary market for some NFTs are more active as compared to some of the corporate bonds.” - Blockchain / Crypto firm***

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***“In the crypto world we are seeing the liberation of the social connection even if it is commercial. We can now build a direct bond with another person on the other end of the transaction.” - Blockchain / Crypto firm***

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## **New Types of Digital Assets are Likely to Emerge from Both Individuals and Institutions**

Over time, the NFT model may be applied to other areas of the digital realm and open up the “creator” universe to a whole variety of digital assets.

This may trigger a shift in individuals’ expectations around how they engage with corporate structures and platforms, as they look to become beneficiaries of the economic value that they themselves create and no longer be relegated to having a passive experience as a mere consumer of the platform. It may also prompt a shift in company behavior as they look to directly monetize some of their own digital assets, creating liquidity pools around unique offerings to better value and capitalize their offerings.

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42 “New Music NFT Platform BAND Royalty Just Sold 3 NFTs for \$200K”, Glocal News Wire, May 5, 2021, <https://www.globenewswire.com/news-release/2021/05/05/2223780/0/en/New-Music-NFT-Platform-BAND-Royalty-Just-Sold-3-NFTs-for-200K.html>  
43 “Louis Vuitton, Cartier, Prada to Use Bespoke Blockchain to Tackle Counterfeit Goods”, Tanzeel Akhtar, Coindesk, April 21, 2021, <https://www.coindesk.com/louis-vuitton-cartier-prada-aura-blockchain-consortium>  
44 “How to Create, Buy and Sell NFTs”, Ollie Leech, Coindesk, March 12, 2021, <https://www.coindesk.com/how-to-create-buy-sell-nfts>

### Individuals May Expand the Concept of Being a Creator to More Broadly Being an Issuer

Individuals may become more attuned to the idea of monetizing the unique assets and capabilities they contribute to digital platforms as a result of their spending time, engaging in financial transactions, developing content, or acting as marketers / influencers for the platform. They could become issuers in their own right, capable of monetizing their own distinct contributions to a platform.

Through the application of this model, individuals could gain access to a broader range of sources of economic value. Examples include the following:

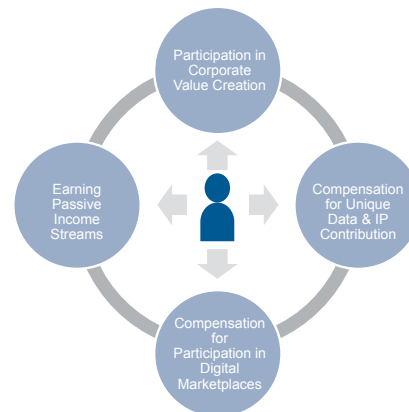
- **Monetizing Data:** As more consumers seek to monetize the platform value they create by allowing access to their data, startups such as Killi are emerging to capture and aggregate those data contributions, and reimburse individuals through a “data paycheck”.<sup>45</sup>
- **Monetizing Content:** Individual pieces of content may also be tokenized, allowing individuals to track and retain ownership of their items. We may see the emergence of micro-collecting, where individuals buy specific, micro-assets such as a Facebook post, a YouTube video or a Substack blog post. Already, Jack Dorsey’s first tweet sold for \$2.9 million in the form of an NFT.<sup>46</sup> Mark Cuban sold a NFT with his picture and one of his famous quotes, “Nobody ever changed the world by doing what everyone else was doing” pasted on top of it for \$1,700. The token includes a 15% royalty on secondary sales.<sup>47</sup>
- **Monetizing Influence:** While top influencers command high remuneration for the financial value they generate for their corporate sponsors, as discussed earlier, these cases tend to be outliers, leading some to jumpstart a movement to create an influencer “middle class”.<sup>48</sup> The tokenization wrapper could help to put a direct monetary value to virality. An early experiment in this space can be found in the Rally Creator Community. This is an open platform enabling anyone to become a “creator”.<sup>49</sup> Issuers mint their own personalized, branded coin on the Ethereum network, allowing them to connect directly with their followers whose purchase of the social token enables them to access

exclusive content and unique merchandise.<sup>50</sup> Furthermore, creators and their private communities are eligible to earn “community activity rewards” to the extent their activities help support the growth of the overall network.<sup>51</sup>

- **Monetizing Rewards:** Finally, tokenization could also unlock the value created by consumers’ economic participation in platforms. Via tokenization, loyalty memberships, and rewards points could be converted into a standardized, exchangeable currency, and could also be utilized as collateral to borrow funds and raise capital. Pepcoins, from PepsiCo are an early experiment to explore the potential for this approach. Consumers scan certain Pepsi-owned beverages or snacks that they purchase and are automatically awarded Pepcoins which get transferred into direct cash deposits into a owners Venmo or PayPal account as certain thresholds of coins are reached.<sup>52</sup>

All of these models offer individuals’ new ways increase their wealth. The new economic opportunity pools are illustrated in Chart 3.3.

**Chart 3.3: Tokenized Digital Assets Expand Individuals’ Economic Participation in the Digital Sphere**



Source: Citi Business Advisory Services

Over time, the proliferation of new types of digital assets could lead to the creation of marketplaces to facilitate the issuance and trading of those assets, giving rise to a whole new set of investable opportunities. Some of these markets could be considered subscale

45 Killi, [www.killi.io](http://www.killi.io)

46 “Jack Dorsey’s first tweet sold as an NFT for an oddly specific \$2,915,835.47”, Kim Lyons, The Verge, March 22, 2021,

<https://www.theverge.com/2021/3/22/22344937/jack-dorsey-nft-sold-first-tweet-ethereum-cryptocurrency-twitter>

47 “Billionaire Mark Cuban is selling a motivational quote as a NFT for \$1,700”, Theron Mohamed, Business Insider, March, 13, 2021,

<https://markets.businessinsider.com/currencies/news/billionaire-mark-cuban-sells-motivational-quote-nft-crypto-blockchain-2021-3-1030186572>

48 “The Creator Economy Needs a Middle Class”, Li Jin, Harvard Business Review, December 17, 2020,

<https://hbr.org/2020/12/the-creator-economy-needs-a-middle-class>

49 Rally, <https://rally.io/>

50 ibid

51 ibid

52 Pepcoin, <https://www.pepcoin.com/faq>

from the viewpoint of an institution seeking to deploy large amounts of capital, but they might be rightsized for individual investors. Moreover, these investment opportunities may resonate with a broader set of retail participants and offer them an ability to link their investments to their own areas of interest.

This approach might resonate particularly well with young investors able to use the sometimes low cost entry point for such assets to collect items like digital stickers or gaming assets as investments, helping them learn about how to build portfolios early in their lives. These audiences tend to be particularly drawn to placing their investment dollars into opportunities which they find meaningful from a personal standpoint. Specialized investment marketplaces could create on-ramps to onboard those investors and convert them into lifetime customers.

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***“There is a generational gap in terms of the adoption of these digital assets especially NFTs, young people are certainly very fascinated of owning new tokenized stuff. I think, there is a value or some sort of pleasure associated with owning something virtual.” - EMEA Asset Manager <\$500 billion AUM***

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***“With NFTs, I think the technology is being used in a way to create things that we can recognize.” - EMEA Investor***

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***“I think the next generation investor is a little more narrative driven. It’s important for them to understand what it is they are investing in and to have some affinity for that.” - NAM Asset Manager <\$500 billion AUM***

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### **Companies Could Use Tokenization to Help Value Their Own Intangible Digital Assets**

Instead of non-fungible tokens, companies may go a different route and create fungible token pools to unlock the value of their intangible digital assets. Being able to value these assets can unlock stranded value within a company and inform the overall firm valuation more precisely. Having the tokens be fungible could facilitate institutional level volumes and marketplaces, allowing a broader range of investors to participate.

An analogy can be drawn from how the recent rally in Ethereum’s ETH coin has been linked in part to rising demand for DeFi and NFT tokens. As these dapps,

built on Ethereum platform, become more successful in their own right, the value of the Ethereum ecosystem multiplies and that value gets reflected back into the ETH coin.

In a similar way, companies may see value in allowing investors to directly participate in the economic benefits created from a part of their ecosystem with the hope that the rising value of the token pool will reflect back into their overall corporate valuation and support better modeling of their growth potential. Many options for such access exist, a few of which are listed below:

- **Revenue Sharing:** Many of the intangible digital assets cited at the outset of this section are used to drive revenues. For example, Facebook’s Mark Zuckerberg noted in an op-ed that “based on what pages people like, what they click on, and other signals, we create categories—for example, people who like pages about gardening and live in Spain—and then we charge advertisers to show ads to that category.”<sup>53</sup> This is a way that they are leveraging their proprietary data. Issuing a token that represents a fractional ownership in Facebook’s data pool and entitles the holder to earn a small portion of the money that Facebook generates for this information might unlock significant liquidity for Facebook, and allow them to demonstrate that the value of their data is perhaps multiples of the ad revenue they generate. This in turn might support higher valuations for Facebook’s stock price. Such a token could be sold directly to investors as an income opportunity or issued to platform users that surpass a certain threshold of activity as a participation incentive.
- **Protocol Development:** Data processing algorithms are another category of intangible digital asset that companies struggle to value. The activity being performed in these processes is already code-based. Some might be suitable to commercialize and offer as their own unique protocols. Companies could issue native tokens for the protocol, allowing users to purchase tokens for access to the service and rewarding users of the protocol for their participation. For example, the TikTok “For You” page algorithm might be adapted to operate with any video-based data set. Existing and new video platforms may buy access to the protocol and plug it into their own offering, negating the need for them to develop their own algorithm. Investors may also purchase “For You” protocol coins if they are convinced that the value of the tokens will go up based on demand for the protocol.
- **Staking:** Many times companies are unable to invest as much as they would like into innova-

53 “Fact check: Does Facebook sell your personal data?”, Annalee Monroe, AZ Central, February 15, 2019, <https://www.azcentral.com/story/news/politics/fact-check/2019/02/15/facebook-business-but-does-sell-your-personal-data/2701066002/>

tion initiatives because too much of their capital is locked up in business as usual or existing projects. Tokenization could be used to generate liquidity for new projects. Monies raised through the token sale could fund the initiatives and offer investors a return on their investment through a partial ownership stake in any patents filed by the company. The costs of corporate research and development are significant and companies bear a disproportionate share of such costs. A 2018 Business Research and Development Survey found that U.S. businesses spent \$441 billion for R&D performance, of which \$378 billion was supported by their own capital and only \$63 billion of which was funded by other sources. Organizations that are seen as highly innovative or that rely on a steady pipeline of new production creation could demonstrate a financial value for this intangible R&D process based on the total value of the token pool, treat their R&D process as an asset on the balance sheet, and use it to justify higher valuations about their future growth potential.

All of these approaches and the ones described for individual investors as well show that it is becoming possible to encapsulate digital assets in new wrappers that make it possible to own, value and trade them. The models emerging from the crypto domain are providing new templates that may unlock that potential. In turn, it is helping to define a new framework for determining the value of digital assets.

***“What are the products that we can provide that can access the markets in so many different ways. It is about increasing the menu and increasing the options.” - EMEA Hedge Fund***

***“You create industry around products and convince people how to associate value to that. That’s how the current NFT industry is behaving. I think people would always praise for being associated with something that has value.” - EMEA Hedge Fund***

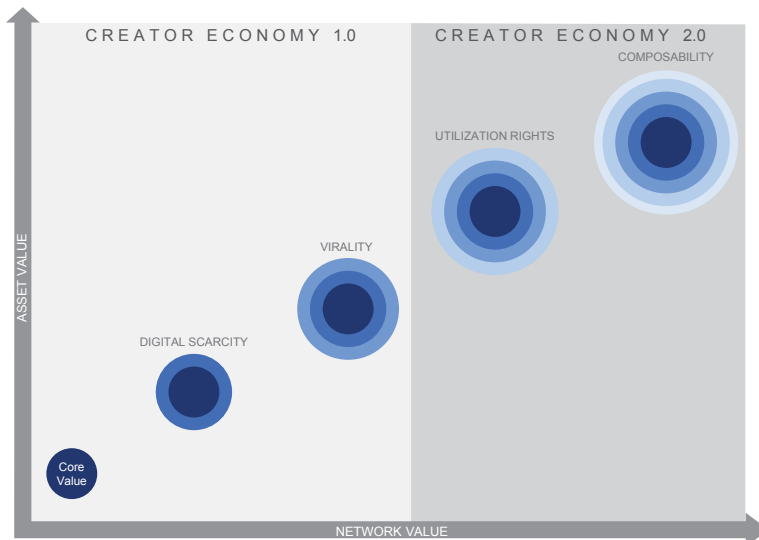
***“NFTs have spotlighted characteristics such as uniqueness and provenance and opened up new markets of other assets that weren’t thought of as being easily transferred or as having value.” - Blockchain / Crypto firm***

***Attributes that Make a Digital Asset “Valuable”***

As discussed earlier in this chapter, the way that investors value digital assets today is lacking and often reflect nothing more than broad approximations of how these new sources of economic value drive price appreciation or depreciation. Using the models emerging from the crypto domain’s petri dish of innovation and exploring how those templates may be applied to unlock value in digital assets using either DeFi principles or NFT approaches has highlighted the key attributes that investors can focus upon to better understand such assets. These are summarized in Chart 3.4.

Based on dialog with survey participants, two axes seem to determine the value of digital assets—network value and asset value. These elements are intertwined. The more usage that a network draws, the higher the potential value of assets provided by that network and vice versa. This is because there is value in the accompanying pool of digital exhaust that gets generated by the interactions around that asset and because there is a community effect that draws in participants that

**Chart 3.4: Developing a New Digital Asset Valuation Framework**



Source: Citi Business Advisory Services



want to be where others are finding value in the digital world. This fear of missing out (FOMO) is an important consideration and creating “attraction” is one of the key drivers of how networks grow.

Within these parameters, there are a series of attributes that seem to define how valuable an asset may become within a network ecosystem. Digital scarcity is the first attribute. For companies, this means that proprietary assets are likely to be seen as more valuable and for individuals this means that an asset being tendered in the digital realm should be unique.

Assets that are able to achieve virality then start to increase their worth. The continued exchange or growing utilization of the asset amplifies the value, generating more interactions, more data and more community interest. The current incentive models on social media platforms like Instagram, YouTube, TikTok, and others that pay individuals based on the amount of views or downloads they achieve demonstrates how these attributes are being monetized in the current version of the creator economy.

If the DeFi models and NFT template begin to cross-over from the crypto domain to the broader digital economy, new attributes are likely to be added to make a digital asset even more valuable. These would be attributes of version 2.0 of the creator economy.

The ability to establish ownership of an asset brings with it an ability to grant utilization rights. The issuer of the asset has and should be able to transfer certain rights to the purchaser of the asset and maintain certain rights for themselves using smart contract capabilities to embed such rights within the asset itself. Legal frameworks are still being determined to enforce this concept, but it is possible to envision how contract law could be adapted to operate within the automated enforcement regimes of smart contracts.

The final attribute that survey participants described as having significant potential was the ability to expand the usage of an asset beyond its originating network and make it interoperable and portable, thus enabling it to be utilized across multiple domains. This is often described as composability. Protocols in the DeFi space are composable as noted in Section II and NFTs may become composable as interoperability across platforms is achieved. It is a newer aspect of the crypto experiment that is still just beginning to be explored, but is seen as having tremendous potential.

As tokenization unlocks these new sources of value in the digital realm and establishes new types of assets and forms of ownership, there is a growing likelihood that the model may extend to create new opportunities in the physical realm as well.

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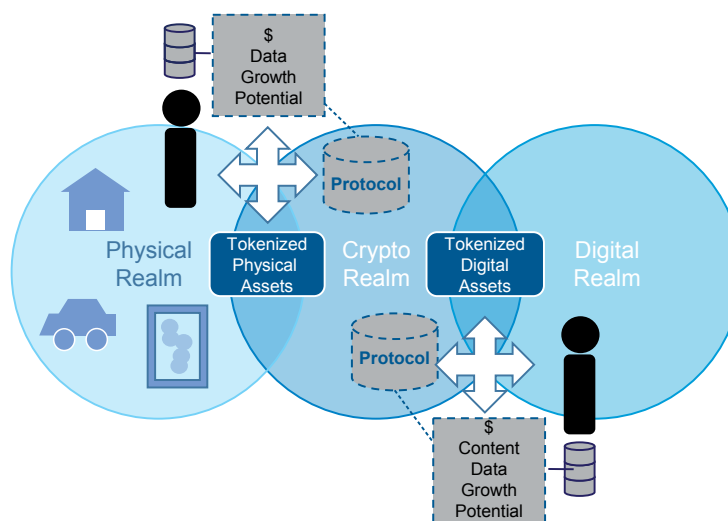
*“There’s this idea from the analog world that the scarcity of ownership and scarcity of consumption need to coexist. For example, someone owns a rare painting, and only visitors to their home or a gallery get to see it. NFTs enable someone to own digital art, but for anyone anywhere to enjoy it, even copy it. Counterintuitively, this separation increases the value of scarce goods, because people can own assets that go viral.” - Citi*

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*“Before you could never coordinate people on a global basis to do something but a token and economic incentive allows us to coordinate globally. As a result we have this massive network that I think will be very very big.” - Blockchain / Crypto firm*

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**Chart 3.5: Digital Templates Can Extend to Enable Tokenization of Physical Assets**



Source: Citi Business Advisory Services

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***“NFTs are good as they take non-fungible assets and tokenize them and have the potential to create cash flows out of it. It could create a kind of barter economy.” - EMEA Investor***

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## Digital Templates Can Extend to Enable Tokenization of Physical Assets

Over time, tokenization is also likely to become the mechanism to capture and effectively harness the sources of economic value stranded in illiquid physical assets. This is illustrated in Chart 3.5.

Although templates built on the NFT model would help extract the value latent in the digital sphere, a significant amount of value would remain locked up and stranded in the physical realm. Institutional investors have significantly expanded the amount of capital they are allocating to investment managers able to access real asset opportunities in recent years. Real estate and infrastructure fundraising amounted to \$1.8 trillion between 2015 and 2020<sup>55</sup> and alternative investments have come to represent 26% of pension fund assets in P7 countries in 2020, up from only 7% in 2000.<sup>56</sup>

Yet, most retail investors have been locked out of these opportunities as discussed in Section I. To match current or target institutional allocations as of 2020, retail portfolios would have needed to add between \$2 and \$3 trillion in real assets. Looking at the next five years, the size of the gap could increase to as much as \$4-\$5 trillion.<sup>57</sup>

To date, there has been no extension of the “creator economy” concept to the physical realm. Sharing models discussed earlier for individuals’ homes and cars through models like Airbnb and Uber opened up an avenue to garner some monetization of these assets, but these offerings only facilitate an ability to generate cash flows through utilization of the asset. Monetizing the full value of the asset itself is still not possible for individuals except through the sale of the asset.

This poses a significant challenge for individuals looking to optimize their wealth creation since for most retail investors, the majority of their net worth is tied up in these illiquid assets—particularly one’s home.

Attempts to unitize real assets and create fractional and more liquid investment opportunities for retail investors are emerging, but only in isolated pockets. Australian company BRICKX offers a real estate platform to provide fractional ownership in properties. The platform divides the properties into “bricks” and pays the investor a portion of the monthly rental income after paying for expenses and their management fee. Investors can also realize any appreciation in the asset via a secondary marketplace.<sup>4</sup> Cadre is an e-commerce site for investing in commercial real estate that connects accredited investors to property deals across the U.S., allowing deal-by-deal discretion.<sup>59</sup> There has also been experimentation with blockchain technologies, such as in the case of tokenizing a REIT structure to issue fractional shares in the St. Aspen Regis Hotel to accredited retail investors.<sup>60</sup>

These initiatives are expanding to other types of physical assets, including collectibles and physical art, but again, these new models are only finding niche status. The Rally platform enables investors to access collectible items such as unique cars, wine, or sports memorabilia, for as little as \$1.<sup>61</sup> By the fall of 2020, Rally had facilitated the issuance of approximately \$15 million in assets.<sup>62</sup> Masterworks employs a similar model for physical fine art.<sup>63</sup>

In our inaugural Industry Revolution report released in 2018, the Business Advisory Services team focused in on the tokenization of physical assets as a key transformational force likely to alter the entire nature of investor portfolios. While we missed that the drive to tokenize assets might emerge first from the digital realm, the basic argument we made in that 2018 report remains intact.

In fact, the core premise of being able to use tokenization as a means of fractionalizing and democratizing access to an asset; the ability to list those tokens on a blockchain to trace ownership and to use smart contracts to embed financial and utilization rights in the asset itself is being borne out by the emerging NFT experiment.

We still believe strongly that the marketplace for the digitization of physical assets will emerge and that sentiment was echoed by many of the survey participants. As current models demonstrate, both financial and non-financial rights can be encoded at the asset level. Economic rights can include performance-based incentives for the token issuer or manager of the physical asset and a separate set of incentives could be

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55 Citi Business Advisory Services’ analysis based on data from Broadridge Global Markets Intelligence

56 “Global pension funds weather the storm of 2020, Thinking Ahead Institute,” as cited by Willis Towers Watson, February 16, 2021, <https://www.willistowerswatson.com/en-GB/News/2021/02/global-pension-funds-weather-the-storm-of-2020>

57 Citi Business Advisory Services, analysis based on proprietary subscription to Cerulli Associates: 2018 State of the U.S. Retail and Asset Management Industry report

58 BrickX, <https://www.brickx.com/>

59 Cadre, <https://cadre.com/>

60 “Elevated Returns gets \$18 million for St. Regis Aspen Resort ‘tokenized real estate’”, Dean Takashi, VentureBeat, October 9, 2018, <https://venturebeat.com/2018/10/09/elevated-returns-gets-18-million-for-st-regis-aspen-resort-tokenized-real-estate/>

61 “Rally raises \$17M to expand a platform that lets you invest in (but not buy) collectibles”, Ingrid Lunden, Tech Crunch, September 29, 2020, <https://techcrunch.com/2020/09/29/rally-raises-17m-to-expand-a-platform-that-lets-you-invest-in-but-not-buy-collectibles/>

62 ibid

63 Masterworks, <https://www.masterworks.io/>

included for investors including access to cash flows and asset appreciation. Non-financial rights could provide the token issuer or manager with oversight rights such as the ability to make capital improvements and the token owner with special access or utilization opportunities around that asset.

What is new and strengthens the argument for the tokenization of physical assets is the democratization of the creation process. While there are no protocols today that would allow an individual to tokenize their physical assets, it is now possible to envision the pathway to such a capability. Many in the industry today are working on the issue of tokenization of physical assets, but as we explore the potential within a regulated regime, we should remain attuned to initiatives happening in the crypto realm to see if the developers and retail participants driving innovation in that unregulated sandbox do not design their own solution as an end-run around the industry.

It may be but a small step in a creator economy to think about the entirety of an individual's, and perhaps eventually a company's or institution's physical as well as digital assets as fodder for the creation of new investment opportunities.

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***"I think illiquid assets will still be the last to come. The interfacing of something that is purely physical and using it as collateral is still challenging."***  
- Citi

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***"The mass securitization of personal assets, and/or time, what a person can do with themselves on media or unused assets that usually can't be carved up. Buying a small piece of my house if I wanted to sell some of the equity. That feels tradeable."*** - NAM Hedge Fund

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***"We have already seen the tokenization of real world assets, for example tokenized real estate assets. We will likely see tokenization continue to happen across capital markets for traditional financial assets to exist on the improved financial infrastructure of blockchain."*** - DeFi Protocol

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## **Investor-Driven Activities & Asset Creation Represent New Financial (NewFi) Landscape**

As tokenization unlocks latent sources of economic value in new types of digital, and perhaps soon physical assets, and as DeFi protocols improve and become

more tested and cost effective, the opportunity for investors to both create their own assets and initiate their own financial activities may grow and extend from niche crypto players to a more robust and professional ecosystem of individuals, companies, and institutions.

The goals of that system may be analogous to what occurs in the traditional financial system. Certain participants will issue investible instruments. Other participants will want to buy and sell these assets as well as finance them, post them as collateral, and collect premiums for staking the assets and providing liquidity.

The main differences between this new financial ecosystem (NewFi) and the traditional financial ecosystem (TradFi) might be that the array of potential issuers is far larger, the types of assets that might be created as investible opportunities would be far more varied and the embedding of those transactions into an investor's day-to-day life may be far more integrated than today's financial marketplace.

As discussed earlier in the chapter, the token wrapper can facilitate the portability of sources of economic value previously stranded in one platform to other platforms. These new assets thus become tradeable against each other. This might mean that an individual investor can extract the value derived from his or her Amazon Prime membership and render that tradeable against the aggregate value of his or her airline frequent flyer points.

Similarly, tokenized assets could be used as collateral in borrowing and lending activities. A corporation could isolate the value locked in its proprietary customer behavioral profiling algorithm and post that as collateral against borrowing funds to build a new plant and then tokenize ownership of that plant to provide workers with participation tokens that increase in value alongside their salaries and encourage them to build roots and improve their community. Individual investors could also utilize their IP, expressed in token form, in a similar way. Applying the crypto model could ensure that economic value is not only created, but also utilized more effectively.

Both the technology wrapper and principles inspired by the crypto petri dish may gradually cross-over into the investment and capital markets functions performed by traditional finance, but several challenges would have to be overcome for this to occur. Such challenges as well as the amplified value that combining the NewFi and TradFi world might enable are explored in Section IV. While this new financial domain would initially remain separate from TradFi, a series of catalysts could bring about their merger as detailed in the next chapter.

## Section IV: Launch of CBDCs May Trigger Merging of TradFi and NewFi Realms & Redefine “Assets” and “Asset Management”

As noted in Section I, there has been only incremental innovation within the traditional financial investment (TradFi) realm as incumbents focus their efforts on improving existing processes rather than starting from what the technology makes possible. Such constrained thinking reflects a basic reality: a complex set of pipes, plumbing, and processes are used successfully by a web of counterparties and service providers to process billions of dollars worth of transactions every day, and layers of regulation are intricately woven into the entire ecosystem. In the face of this there is little appetite to begin any wholesale redesign of this system which works and is operating effectively, even if redesign offers the prospect of greater efficiency and better accuracy

Meanwhile, the emerging new financial investment ecosystem (NewFi) is still in its infancy with Bitcoin having been in existence for just over a decade, and Ethereum and many of the newer platforms and protocols driving innovation having launched in just the past 5 or 6 years. There are still key pieces of the crypto experiment that do not work at scale, and elements are still missing that would be required to facilitate broad participation.

As a result, the split between these two investment domains is likely to persist for some time. The same however cannot be said of the payments space.

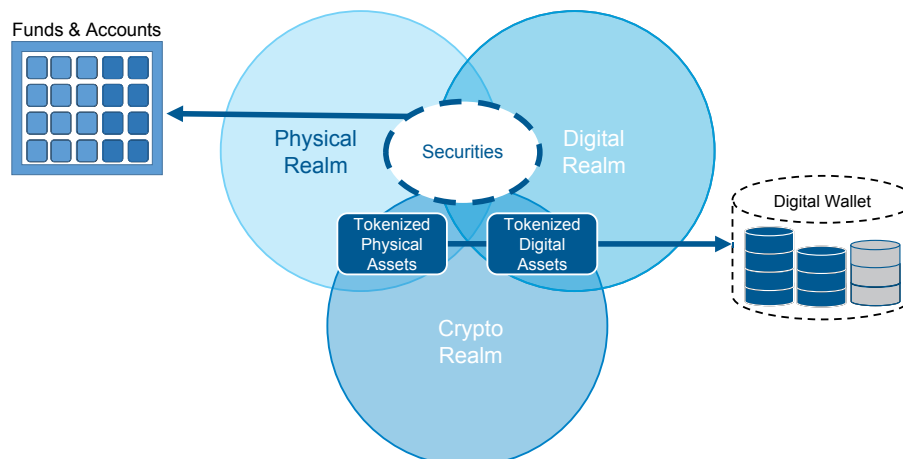
The clash between traditional and emerging payment approaches is already creating direct competition and influencing the pace of innovation across established participants. Some of this innovation is coming from commercial enterprises, but the initiatives with the most transformative potential are coming from the global set of central banks. When such institutions

begin to contemplate and create new operating models the effects are likely to be felt across the global economy and with transformative implications.

For the investment management industry, the launch of central bank digital currencies (CBDCs) may prove to be the trigger that ends the current system’s period of inertia and spurs a wholesale re-design of the processing, settlement, and management of securities, and increasing the impetus to begin tokenizing the industry’s basic units of equities, bonds, and funds.

If this happened, the differences that currently prevent interoperability between the TradFi and NewFi domains would fade and pathways to new capabilities created. All of an investor’s assets—securities, both physical and digital—could be considered holistically in designing and building investment approaches. Having such breadth would transform the role of “asset” manager and further blur the lines between investment management, wealth management, and banking.

**Chart 4.1: Delivery of Investment Management to Various Investor Types**



Source: Citi Business Advisory Services

Understanding how far the industry is from reaching this goal is a critical starting point.

## Securities Industry Resists Tokenization—Forcing Investors into Parallel Investment Regimes

While tokenization experiments are emerging to create investment bridges between the crypto-digital and the crypto-physical realms, equities and bonds, as well as traditional investment funds, remain mostly immune to these pressures. At present, the securities world and the world of tokenized assets exist in parallel universes, as illustrated in Chart 4.1.

### Securities Accounts are Not Comparable to Digital Wallets

As shown, today's securities sit at the intersection of the physical and digital realms. They represent claims on wealth or debts in the physical world, but the instruments themselves are digital. This was not always the case, however.

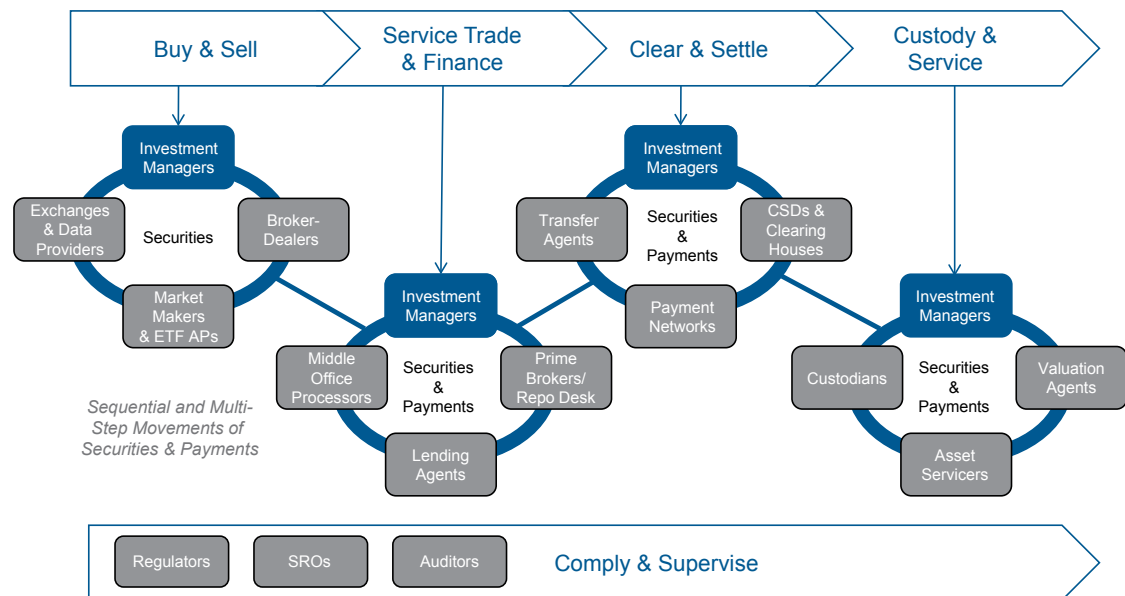
Historically, securities certificates were physical assets—actual pieces of paper. By the late 1960s, daily volumes on the New York Stock Exchange were so high that it became impossible to physically move the certificates around. The sheer volume of stock certificates and other paperwork overwhelmed brokerage firms' back offices, hobbling the firms' ability to complete trades in a timely fashion and ultimately forcing many out of business. The chaos, dubbed the Paperwork Crisis, also allowed thieves to prosper, with some \$400 million in securities being stolen between 1969

and 1970.<sup>1</sup> Subsequently, the industry looked to emerging technology solutions. Paper certificates were first immobilized and stored in a central location, and over time the ledgers associated with these assets became digitized and the certificates themselves were dematerialized into book-keeping entries.

Although securities and tokenized assets both exist in digital form, the way that investors hold and own these two types of assets is not comparable.

- According to FINRA, the majority of securities worldwide are owned in the “street name” of the broker or dealer that facilitates their trading.<sup>2</sup> The broker or dealer is listed as the owner of record, and the individual or institution purchasing the securities is listed as the “beneficial owner”. Thus, most investors' accounts only represent a claim on the securities they own through a book-entry set of ledgers. A company that issues securities is only able to see the owners of record, not the full set of beneficial owners, in most jurisdictions.
- By contrast, token issuers keep their own direct record of all token holders. For investment purposes, individuals or institutions who purchase tokens “own” them outright and are able to control their coins directly via their digital cryptocurrency wallet. This wallet is *not* an “account”. The wallet is the investor's unique “key” that matches the owner to the wallet address on the token issuer's blockchain, and allows the owner to unlock the security protocols of that blockchain wallet and initiate the movement of their tokens. Thus,

Chart 4.2: Extensive Web of Counterparts Involved in Securities Transactions



Source: Citi Business Advisory Services

1 "It's Your Stock, Just Not in Your Name: Explaining 'Street Names'", FINRA, December 21, 2015, <https://www.finra.org/investors/insights/its-your-stock-just-not-your-name-explaining-street-names>  
 2 ibid

a participant in the crypto realm may have one digital wallet, but their assets may be held across a variety of underlying blockchains. It would be as if each stock and bond held in the investor's account resided with the issuing company, and all changes in the ownership of those instruments were recorded and fulfilled by the company itself.

- Investing in securities and investing in tokens are not equivalent and differ in important respects at the present time.

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***"I think the value of blockchain is the ability to locate. We used to work with a lot of brokers who knew they had a CUSIP on their balance sheet, but couldn't tell you where that bond actually was. The ability to immediately locate assets and transfer ownership is a great blockchain ability." - Blockchain / Crypto firm***

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### **Infrastructure to Support TradFi is Entrenched and Highly Specialized**

Today's ecosystem supporting the trading, clearing, settlement, custody, and servicing of securities – having evolved organically over many decades – is extremely complex, relies on a byzantine system of pipes and plumbing, and involves a broad set of organizations that each provide specific functions across the lifecycle of a transaction. There are multiple stages to the process, and for most tasks there is a dual exchange of securities (or securities information) and payments (or payments information). This is illustrated in Chart 4.2.

This process has four notable features. 1) it consists of a linear sequence of many individual steps; 2) it has a high degree of complexity with a large number of participants required to interact to complete the transaction chain; 3) there is a considerable degree of inherent risk because each participant has their own processes and guidelines, and each is working from their own infrastructure that is not interoperable with others and 4) it is structurally inefficient with multiple hand-offs, sign-offs, reconciliations, inputs, and outputs each creating a potential break in the process which may require investigation and negotiation to address and resolve.

Efforts to compress the time it takes to perform an end-to-end transaction keep failing because of these considerations. The vision of straight-through-processing (STP) has been discussed in the industry for more than 20 years, but it still takes at least two days after the trade date for the settlement cycle in equities and most corporate securities (T+2). Those extra days are required to give participants time to perform the multitude of tasks

required and identify and solve the potential issues that are part and parcel of post-trade processing.

Moreover, regulators and self-regulatory bodies are sensitive to all the potential points of failure and thus monitor each and every step of the process to ensure that there is no wrongdoing, since issues could emerge from so many sources.

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***"There is so much inefficiency just based on the cumbersome nature of traditional finance. Over two decades almost every aspect of finance will be disrupted." - DeFi Protocol***

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***"The nuisance of T+2 settlement, including capital requirements for brokers and clearinghouses, has a lot of room for improvements and it could pretty much be eliminated entirely with an automated market maker." - DeFi Protocol***

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***"In Switzerland, they already support the full digital issuance of a security so they can automate the process from issuance to settlement. The system is based on DLT, so when the security is traded in the secondary market, it settles instantly and there is no T+2 cycle." - Citi***

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### **Despite Issues, Participants Show Little Interest in Upgrading the Existing Approach**

The costs of managing such an intricate system are significant. Broadridge estimated that in 2015, the industry spent between \$17 and \$25 billion on securities processing globally.<sup>3</sup> Given the magnitude of that sum, many expected a massive reworking of the system to commence as soon as the potentials of blockchain technology were better understood, but that has not been the case. Several factors underlie this reluctance to change:

- **Sunk Costs and Organizational Inertia:** Most organizations have developed their own, often proprietary, systems to operate in this ecosystem and have designed their operations and technology organizations around these applications and processes. Keeping their existing platform up and running consumes the majority of their annual technology budget. A recent industry survey categorized investment managers by how much of their annual technology budget they spend on innovation – on improving the future rather than maintaining the present. "Front runners" – those spending the most on new and transformative initiatives – allocated 44% of their technology budget to business as

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3 "On the Future of Securities Settlement", BIS Quarterly Review, BIS, March 2020, [https://www.bis.org/publ/qtrpdf/r\\_qt2003i.htm](https://www.bis.org/publ/qtrpdf/r_qt2003i.htm)

usual (BAU) to keep their legacy infrastructure working. An even higher percentage was spent on BAU in other categories with “transformers” spending 55% and “late movers” 68%.<sup>4</sup>

- **Regulatory Stasis:** Regulators have naturally built their oversight regimes to operate within the existing ecosystem, and would have to replace their technology and rework their processes and controls to operate in a completely revamped system - while maintaining continuity of control and oversight as they transitioned. Ignoring the risk side of the equation and just focusing on the cost, this would be very significant indeed. FINRA, the not-for-profit self-regulatory body funded by industry fees, reported operating expenses of \$951 million in 2020, 25% of which (\$275 million) was spent on member supervision and 14% of which (\$157 million) was spent on market regulation. Only 7% of the entire budget was devoted to “extraordinary initiatives” and the group’s digital experience transformation was just one line item within that 7% allocation.<sup>5</sup>
- **Existential Threats:** Key players, with businesses optimized to the status quo, face potential disintermediation or significant losses of revenue if a new order were to emerge. Today’s approach is specialized and sequential. Certain participants own exclusive rights to the data produced at specific points in the process that the entire industry must share to effectively operate. Other participants own specific parts of the process itself and these organizations must be utilized to successfully fulfill an end-to-end transaction. The transparency inherent in a blockchain based ecosystem, that allows all nodes to see the data generated by a transaction, and the way that these ledgers operate by simultaneously moving assets and payments between participants might require exchanges, market data providers, central securities depositories and clearing houses, transfer, payment and valuation agents, and potentially others to seriously rethink and adjust their business models.
- **Scale of Undertaking:** The final factor suppressing appetite for change is the size of the challenge itself. The end-2020 value of all worldwide government and corporate bonds outstanding was estimated at \$133.4 trillion and the value of all global equities at \$103.2 trillion according to analysis based on Bloomberg Research.<sup>6</sup> Tokenizing these securities to operate on a blockchain system would require a truly massive transformation effort to re-issue, re-platform, and re-assign all of these securities from accounts to wallets. Moreo-

ver, solutions would entail a redesign of the current system to address various ownership issues e.g., owners of record versus beneficial owners.

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***“This (crypto) lab is throwing things out in the world. The financial industry is looking at it, with a high level of curiosity and interest. But depending on who you are in the ecosystem, also with some worry—you might be disenfranchised or disrupted.” - EMEA Asset Manager \$500 billion - \$1 trillion AUM***

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***“Clearinghouses will become governance entities over these networks. They will continue to have the registration and I think that is how they evolve with the threat to their business models.” - Citi***

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***“The idea of clearinghouses in today’s world is what regulatory nodes might be in the new world.” - Blockchain / Crypto firm***

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### **Crypto Ecosystem Not Yet Robust Enough to Support Wholesale Replacement**

Even if sufficient will to tokenize securities and revamp securities processing existed, the options on what to replace it with at this point are limited as the blockchain and crypto domains are not yet robust or mature enough to be considered a realistic replacement. Right now, the entire crypto ecosystem is in an early stage of development. Solutions to basic problems are still being worked through.

**Interoperability across different blockchain platforms is a significant concern.** If a provider stays wholly within a single platform universe (e.g., Ethereum), they can benefit from all of the technology benefits discussed in Section II—a single programming language, standard smart contract templates, a common wallet, and composability of primitives and protocols. However, activities that cross chains are still difficult.

A white paper from the World Economic Forum (WEF) described blockchain technology as being “Balkanized in silos.” Individual blockchain networks are not inherently open and are not able to communicate properly to each other. There are a large number of blockchain projects in existence, all of which have different characteristics - such as the type of transactions, hashing algorithms, or consensus models.<sup>7</sup>

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4 “Data and technology in investment management”, Casey Quirk, <https://www2.deloitte.com/us/en/pages/consulting/articles/data-in-asset-management.html?nc=1>

5 FINRA 2020 Annual Budget Summary, FINRA, 2020, [https://www.finra.org/sites/default/files/2020-05/2020\\_annual\\_budget\\_summary.pdf](https://www.finra.org/sites/default/files/2020-05/2020_annual_budget_summary.pdf)

6 Citi Business Advisory Services analysis based on Bloomberg Research

7 “Blockchain and Interoperability: key to mass adoption”, Finextra, July 6, 2020, <https://www.finextra.com/blogposting/18972/blockchain-and-interoperability-key-to-mass-adoption>

Some cross-chain protocols are emerging to address these concerns but these projects are in their early stages and take different approaches. The Wanchain network allows interoperability between very heterogeneous blockchains like Bitcoin, Ethereum, and EOS. Other solutions such as Polkadot, Cosmos, and Hybrix focus on creating connectivity between blockchains, looking to build bridges rather than seeking interoperability.<sup>8</sup>

**Wallet and custody solutions are another point of concern in the crypto domain.** Just as a crypto wallet is different from a securities account, crypto custody is more like a safe-deposit box than a service that provides safe-keeping for a user's investments. Rather than assets being held in the digital wallet, the wallet instead holds the user's "key". This "key" allows its holder to authorize transactions on a blockchain platform, in a manner loosely akin to signing a check. While tokens may be viewed or controlled via wallet software, to the extent that they "exist", it is only in the replicated databases maintained by a blockchain platform's computational nodes and in the form of an account balance, not as a digital "object" in the wallet software itself.<sup>9</sup>

New entrants exploring cryptocurrency trading typically opt to use custodial wallets offered by crypto exchanges such as Coinbase, Cash App, and Binance. In these instances, the "key" is held by the platform offering the service, but without regulatory protections, many participants worry that they may not be able to retrieve their holdings if the platform were to be hacked or were to fail. More experienced participants instead often opt to self-custody, using wallet technology such as Metamask, Numio, or Ledger.<sup>10</sup> This puts responsibility for managing the key in the user's own hands, a solution not suitable for broad adoption within a professional ecosystem.

As more institutional participants enter the space, third party custody offerings are emerging that utilize a new technology approach to securely store the digital key. This is enabling these organizations to obtain insurance for the digital wallet, a pre-requisite for broader participation by professional investors. Some crypto native players are already active in this space and by early 2021 a number of leading traditional custodians had either launched, or had announced plans to launch, crypto custody solutions. Over time, these offerings are likely to provide an important corridor between the traditional and crypto domain, but they are still emergent.

**Processing capacity is the third area creating challenges for mass adoption of crypto models.** Crypto-

currency payment systems are decentralized and rely on a distributed network of verifiers to ensure that transactions that are being accepted by the network and added to the blockchain ledger are accurate.

Bitcoin, the proto-offering in the crypto space, introduced a unique "proof-of-work" process to perform this task. The proof-of-work process requires those looking to verify the transaction to apply computing power to solving a complex mathematical equation in order to add a block of transactions to the blockchain ledger. The process takes time and significant amounts of computational power. Each block only holds about 500 transactions and takes about 10 minutes to add to the chain. As a result, Bitcoin has been able to process only 5 transactions per second, compared to an established payment network like Visa which processes 1,700 transactions per second.<sup>11</sup>

Ethereum also utilizes a proof-of-work process but operates slightly differently. Because Ethereum is a platform that supports many Dapps, each of which is performing its own transactions in its own tokens that have to be tracked and recorded on the Ethereum blockchain, it requires anyone looking to submit a transaction for verification to also submit a "gas" fee which covers the cost of processing the transaction. This gas fee is always paid in ether (ETH), the payment coin of the Ethereum platform. Ethereum has been averaging only 15 transactions per second and the costs of these transactions can at times become excessive as participants offer to pay higher gas fees to prioritize verification of their transactions.<sup>12</sup>

**New approaches to combat these forms of network congestion are emerging.** Solutions look to create second layer chains that record their own sets of transactions and periodically download the accumulated blocks to the main chain. Bitcoin is looking to do this via new solutions launched in 2020 such as the Bitcoin Lightning Network. One Ethereum layer 2 solution is called Optimism and is currently due to launch in July 2021.<sup>13</sup>

Ethereum plans to abandon the entire proof-of-work (PoW) concept and move to a new verification approach called proof-of-stake (PoS). Under PoS, verifiers put their own coins at risk in order to participate. Instead of competing in a power-hungry competition to solve a complicated mathematical equation, the PoS approach rewards all validators who keep their operations up and running on a consistent and regular basis in the form of interest on their stake. The only way to substantially increase the amount of rewards earned

8 ibid

9 "Tokens and accounts in the context of digital currencies", Alexander Lee, Brendan Malone, and Paul Wong, Federal Reserve, December 23, 2020, <https://www.federalreserve.gov/econres/notes/feds-notes/tokens-and-accounts-in-the-context-of-digital-currencies-122320.htm>

10 "The Blockchain Scalability Problem & the Race for Visa-Like Transaction Speed", Kenny L., Towards Data Science, January 30, 2019, <https://towardsdatascience.com/the-blockchain-scalability-problem-the-race-for-visa-like-transaction-speed-5cce48f9d44>

11 "The Blockchain Scalability Problem & the Race for Visa-Like Transaction Speed", Kenny L., Towards Data Science, January 30, 2019, <https://towardsdatascience.com/the-blockchain-scalability-problem-the-race-for-visa-like-transaction-speed-5cce48f9d44>

12 "What is Ethereum and Why Does it Have a Gas Problem?", Joel Kite, Medium, February 7, 2021, <https://medium.datadriveninvestor.com/what-is-ethereum-and-why-does-it-have-a-gas-problem-2c9d8142e160>

13 "No Optimism for Ethereum in March, L2 Scaling Delayed", Limas Kmeliaukus, Cryptonews, March 26, 2021, <https://cryptonews.com/news/no-optimism-for-ethereum-in-march-l2-scaling-solution-delaye-9683.htm>



is to stake more wealth to enable the verification of more transactions. Thus verifiers become increasingly invested in the system's integrity and the alignment of interest continually increases. Developers of the protocol are working hard to find ways in which the computational burden of being a validator can be reduced even further and updated so that even a network of mobile devices could one day be sufficient for securing the network.<sup>14</sup>

Taken together, new solutions aimed at improving the interoperability and connectivity of blockchains, enhancing custody of digital wallets to be more secure, and scaling the ability of the crypto domain to process transactions more quickly may create a suitable ecosystem to support the tokenization of securities, but at present the foundational elements of the crypto domain will require more time to become industrial grade.

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***“Cross-chain interoperability is becoming increasingly important. Cross-chain primitives like cross-chain wallets, liquidity pooling, and provisioning where you can have seamless cross-chain transaction will be the future.” - Blockchain / Crypto firm***

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***“We are still at the baby steps of people just wanting exposure but not wanting to get into details. The user experience needs to be streamlined. If I want to interact with Uniswap, I need to download an Ethereum wallet, save my private key, and make sure I have enough gas.” - Blockchain / Crypto firm***

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***“We failed when we issued a security token in 2018. For this technology to gain mass adoption, you must have solutions that solve day-to-day pains. People don't want to deal with private keys, custodians, etc.” - NAM Asset Manager <\$500 billion AUM***

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***“We are constantly being shown interesting projects and ideas. People need to be comfortable with regulatory concerns, custody, real world fit, etc. and there is an ability to package them in a way that investors can access.” - Blockchain / Crypto firm***

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## ***Hybrid Solutions Emerging to Bridge Securitized Products and Token Ownership***

While the entrenched nature of the current securities processing ecosystem and the immaturity of the emerging crypto domain are both obstacles to change at this point in time, there are a number of current experiments which highlight the potential to utilize blockchain and new crypto token models to enable the trading or processing of traditional securities.

- ***New TradFi Blockchains:*** Solutions to facilitate blockchain based activities in TradFi instruments are beginning. ID2S is a blockchain-based central securities depository launched in 2019 that offers real-time settlement of European money market instruments.<sup>15</sup> Swiss digital exchange SIX has a project underway to create equity tokens on its SDX platform based on the corresponding underlying equities held on SIX.<sup>16</sup> Citi and Bank of America announced in April 2021 that they are launching a multi-dealer next generation trading, data, and analytics platform for structured credit and underlying collateral markets. This multi-dealer platform is expected to initially focus on CLOs and syndicated loans, with plans to expand into other asset classes.<sup>17</sup>
- ***Collateralized Stock Tokens:*** *Binance, the world's largest cryptocurrency exchange, launched tokenized versions of Tesla (TSLA), Coinbase (COIN), Apple (AAPL), Microstrategy (MSTR), and Microsoft (MSFT) stock in April 2021. The stock tokens will be denominated, settled, and collateralized in Binance's dollar-linked stablecoin (BUSD). Each token will represent one share of the underlying company's stock.<sup>18</sup> Interested traders will be required to pass Know-Your-Customer and other relevant compliance measures.<sup>19</sup> Binance is working in concert with Swiss firm Digital Assets AG and a German asset manager CM-Equity AG to offer the product.<sup>20</sup> Crypto derivatives exchange FTX offers a similar product using the same two partners.<sup>21</sup>*
- ***Synthetic Stock Shares:*** The creators of stablecoin platform, Terra, announced the launch of the Mirror Protocol in December 2020, as a way to mint crypto assets that mimic the value of shares in publicly traded companies like Apple and Tesla. Known as mAssets, these tokens will track the price of US-based equities in the real stock market using an oracle system that checks prices every 6

14 "Valid Points: Ethereum's Proof of Stake May Happen Sooner than You Think", William Foxley and Christine Kim, Coindesk, March 17, 2021, <https://www.coindesk.com/ethereum-proof-of-stake-sooner-than-you-think>

15 "Orange, Citi Go Live with Blockchain Based Central Securities Depository ID2S", Ledger Insights, July 23, 2019, <https://www.ledgerinsights.com/blockchain-orange-citi-id2s-central-securities-depository/>

16 "On the Future of Securities Settlement", Morton Linnemann Bech, Jenny Hancock, Tara Rice and Amber Wadsworth, BIS Quarterly Review, March 1, 2020, [https://www.bis.org/publ/qtrpdf/r\\_qt2003i.htm](https://www.bis.org/publ/qtrpdf/r_qt2003i.htm)

17 "Citi and Bank of America to Build New CLO, Syndicated Loan Platform", Finextra, April 14, 2021, <https://www.finextra.com/pressarticle/87105/citi-and-bank-of-america-to-build-new-multi-dealer-clo-and-syndicated-loan-platform>

18 "On the Future of Securities Settlement", Luke Conway, The Street, April 30, 2021, <https://www.thestreet.com/crypto/news/binance-lists-apple-microsoft-microstrategy-stock-tokens>

19 "Binance Launches Zero-Commission Tradable Stock Tokens", Binance, April 12, 2021, <https://www.binance.com/en/support/articles/2c64611658c645a59e05ef12f02c22ab>

20 ibid

21 Tokenized Stocks, FTX, May 3, 2021, <https://help.ftx.com/hc/en-us/articles/360051229472-Tokenized-Stocks>

seconds. These tokens are created using cryptocurrency-backed, as opposed to US dollar-backed, stablecoins.<sup>22</sup>

Whether these new approaches will achieve broad adoption or remain niche products is not clear. Wholesale migration of equities and bonds into tokenized forms, however, is likely to still be some way off. If and when a consensus emerges to transform the structure of these investments, the trigger that initiates an industry-wide change in sentiment is likely to emerge not from the investments space, but from innovations happening in the world of payments.

### Disruption and Innovation in Global Payments Speeds Up as Central Banks Consider Digital Currencies

Cryptocurrencies, and Bitcoin in particular, have been receiving increased focus on the back of announcements from key processors about their intentions to allow their merchant networks to accept these forms of payment. PayPal announced its intention to allow individuals to buy, hold, and sell cryptocurrencies in its network in October 2020<sup>23</sup> and in March 2021 they extended that capability to letting users “checkout with Crypto” in their merchant network.<sup>24</sup> In February 2021, Mastercard announced that it would begin accepting select cryptocurrencies directly on its network<sup>25</sup> and in March 2021, Visa announced that it would allow the use of the USDC stablecoin to settle transactions in its network.<sup>26</sup>

While headline grabbing, these developments represent little threat at present to the use of traditional fiat currencies. The value of all outstanding cryptocurrencies at the end of December 2020 amounted to only \$728 billion—a fraction of what moves globally in terms of payment value.<sup>27</sup>

Prospects for private networks to adapt the cryptocurrency model and launch their own payment coins represent a much more significant challenge however.

### Private Payment Networks Have Potential to Create “Pocket” Economies outside Government View

In June 2019, Facebook announced its intention to launch “Libra”, a universal currency token tied to a basket of sovereign currencies. The move drew significant backlash from regulators and caused key sponsors including Visa and Mastercard to withdraw. As a consequence the group revised its plans and moved to a model where they would launch a private stablecoin backed 1:1 by various government-backed currencies. They renamed the initiative “Diem”, and launched a Switzerland-based nonprofit called the Diem Association to advise the project. Based on a recent press release, the group plans to issue a dollar stablecoin in partnership with Silvergate.<sup>28</sup> In parallel with establishing this partnership, Diem is shifting its main operations from Switzerland to the United States and reflects Diem’s consideration of the evolving digital currency regulatory environment in the US.<sup>29</sup>

Partners in the Diem initiative, Facebook, Uber, Spotify, and Shopify, bring with them the potential for significant network effects as their platforms have billions of users and represent a ready-made distribution network. Diem’s chief economist notes that the initial launch will start with a small number of partners and use cases to ensure the technology and reserve system operate as expected. Over time however expectations are that the group will bring in merchants and other partners.<sup>30</sup>

Private money like Diem could create a major threat to government control of the economy. Though the stablecoin would be backed by a fiat currency, the coin once minted could be used an infinite number of times inside the private network as individuals use their Diem to transact between the member organizations. The only transactions evident to the government issuing the collateral currency would be the initial deposit to mint the Diem and instances when a holder wants to move their Diem holdings out of the network and recover the underlying fiat currency.

22 “Terra Brings 24-Hour Trading to Synthetic Versions of Stocks Like TSLA and AAPL”, Brady Dale, Coindesk, December 3, 2020, <https://www.coindesk.com/terra-mirror-synthetic-us-equities>

23 “Bitcoin Prices Surge After PayPal Jumps Into the Cryptocurrency Business”, Chauncey Alcorn, CNN, October 21, 2020, <https://www.cnn.com/2020/10/21/investing/paypal-bitcoin-cryptocurrencies/index.html>

24 “PayPal to Let Users Pay for Purchases at Checkout Using Bitcoin, Other Cryptocurrency”, Brett Molina, USA Today, March 30, 2021, <https://www.usatoday.com/story/tech/2021/03/30/paypal-let-you-pay-purchases-using-bitcoin-cryptocurrency/7058545002/>

25 “Why Mastercard is Bringing Crypto Onto its Network”, Raj Dhamodharvan, Mastercard, February 10, 2021, <https://www.mastercard.com/news/perspectives/2021/why-mastercard-is-bringing-crypto-onto-our-network/>

26 “Visa Moves to Allow Payment Settlements Using Cryptocurrency”, CNBC, March 29, 2021, <https://www.cnbc.com/2021/03/29/visa-moves-to-allow-payment-settlements-using-cryptocurrency.html>

27 Historical Snapshot, CoinMarketCap, December 27, 2020, <https://coinmarketcap.com/historical/20201227/>

28 “Diem Announces Partnership with Silvergate and Strategic Shift to the United States”, PRNewswire, May 12, 2021, <https://www.prnewswire.com/news-releases/diem-announces-partnership-with-silvergate-and-strategic-shift-to-the-united-states-301290201.html>

29 *ibid*

30 “Facebook-backed Diem Aims to Launch Digital Currency Pilot Later this Year”, Ryan Browne, CNBC, April 20, 2021, <https://www.cnbc.com/2021/04/20/facebook-backed-diem-aims-to-launch-digital-currency-pilot-in-2021.html>

This would in essence create a “pocket” economy that operated independent of traditional government controls. Concerns about this scenario are prompting central banks to accelerate their own thinking and experimentation about how to potentially digitize their own currency offerings. Their main fear is erosion of control over the payment system if private currencies such as Bitcoin or Diem become widely adopted. Experts explain that this could make it harder for authorities to detect money-laundering and terrorism financing but also weaken central banks’ control of the money supply and bank deposits which are one of their principal levers of management of the economy.<sup>31</sup>

In their January 2021 report, the Bank of International Settlements (BIS) found that 86% of the 60 central banks they surveyed are actively researching the potential for CBDCs, 60% were experimenting with the technology and 14% were deploying pilot projects.<sup>32</sup>

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***“The Facebook conceived concept of Diem and that project is rolling out this year despite opposition. I think that does happen this year. That puts digital wallets and the concept of digital money in the hands of billions of people.”***  
***- Blockchain / Crypto firm***

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### **Most Likely Form of Central Bank Digital Currency Would Mimic “Commercial” Money**

Central banks have historically issued money in two forms: cash and deposits. Cash is a physical form of money with built-in security features to make it easy to authenticate but difficult to counterfeit. Deposits, such as reserve and settlement balances, are an electronic form of money existing as digital entries in accounts. They are typically only available to a limited set of entities, certain financial institutions, and the official sector.<sup>33</sup> This is often referred to as “commercial”, “wholesale”, or “interbank” money. Experiments to design central bank digital currencies (CBDCs) are looking at both forms of money.

While it is possible that some systems may choose to tokenize “cash”, the hurdles in doing so are many. Like a banknote or coin, a “cash” CBDC would give its holder a direct claim on the central bank, bypassing commercial banks. The benefit of this approach would

be that it offers individuals and businesses a greater level of security having a direct relationship with the lender of last resort and the issuer of the currency.<sup>34</sup> The downside would be that the central bank would need to run its own ledger, manage its own system of digital wallets and verify its own transactions.

For this reason, most participants expect the current two-tier system to persist. This would lessen the risk for central banks and “relieve them of consumer facing functions that they are simply not equipped to provide screening, on-boarding, off-boarding, servicing, and the building and maintenance of technology platforms.”<sup>35</sup> A far more likely solution for central banks overseeing large economies is to tokenize its “commercial” money to facilitate more frictionless interactions. This type of “commercial” CBDC would not operate like a payment system, but would instead represent “a new form of money enabling an alternative payment rail that maintains the properties of a digital bearer instrument with greater programmability and offline functionality.”<sup>36</sup>

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***“The hallmark of a currency is a sovereign. A sovereign has power because it can tax its people to pay for an army etc. If it loses control over its currency, sovereign would be lost. A CBDC would work similar to bitcoin but have better supervision. They would be asset-backed and more resilient, and can harvest the gains but without the risk of loss of sovereignty.”*** - APAC Asset Manager <\$500 billion AUM

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***“Ultimately, government or regulators would lose some of its power as monetary policy setter if decentralized trades start taking a larger part of the financial world. However, if you exchange these for something like a stablecoin or a CBDC, they would be able to maintain some level of control as that would be under their remit.”*** - Blockchain / Crypto firm

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31 “Explainer: Central Banks Eye Digital Cash to Fend Off Crypto Threat”, Francesco Canepa & Tom Wilson, Reuters, October 9, 2020, <https://www.reuters.com/article/cenbank-currency-digital-facts-idUKL8N2GZ2L3>

32 Central bank digital currency (CBDC), BIS, <https://www.bis.org/about/bisih/topics/cbdc.htm#:~:text=A%202021%20BIS%20survey%20of,would%20be%20a%20digital%20banknote>

33 ibid

34 “How Will Digital Currencies Change Wallets?”, Rajesh Bansal and Somya Singh, Carnegie India, April 13, 2021, <https://carnegieindia.org/2021/04/13/how-will-digital-currencies-change-wallets-pub-84310>

35 “CBDC for commercial banks - Part 2: How to prepare”, Accenture, March 3, 2021, <https://www.accenture.com/us-en/blogs/blockchain-mps/cbdc-for-commercial-banks-part-2-how-to-prepare>

36 ibid

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**“Do digital assets like CBDCs completely replace physical cash, it is difficult to say now. But it is going to be a part of institutional finance. This is going to be a challenge for government and banks to decide if they would be physically trading assets, get fully digitalized, etc.” - Consultant**

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### **Concerns about Disruption Are Driving Innovation in Entrenched Payment Ecosystem**

Whether the threat is coming from cryptocurrencies, private money, or CBDCs, there is a growing sense that the nature of the global payments ecosystem is changing and that new players may emerge as critical providers. This is driving entrenched industry players to accelerate their pace of innovation in an attempt to compete and remain relevant.

By far, the largest of these entities is the Society for Worldwide Interbank Financial Telecommunication network (SWIFT). SWIFT was founded in Belgium in 1973 and currently handles about half of the world’s cross-border fund transfers.<sup>37</sup>

SWIFT is strictly a bank-to-bank transfer service. Today, SWIFT connects about 10,000 financial institutions in about 200 countries, but most of its transfers go through fewer than two hundred banks, brokers, clearinghouses, and corporations.<sup>38</sup> These organizations sit at the heart of the securities processing ecosystem.

SWIFT announced in September 2020 that it was launching a strategy to improve global payments and securities processing, and give financial institutions the ability to deliver instant transactions. In December 2020 it introduced a new service for real-time cross-border payments and transfers called gpi Instant, part of an enhanced SWIFT platform that will “orchestrate interactions between financial institutions and other participants to minimize friction, optimize speed, and provide end-to-end transparency and predictability from one account to another, anywhere in the world.”<sup>39</sup>

The gpi Instant service is the result of collaboration between SWIFT, banks, and payment infrastructures. The pilot is going live after several trial runs earlier in 2020 with Lloyds, Barclays, Commonwealth Bank of Australia, DBS, Wells Fargo, and BBVA.<sup>40</sup>

This upgrade in SWIFT’s capabilities is expected to greatly improve the payments side of securities

processing, but it is unlikely to be transformative. To understand why we need to compare payments moving over the SWIFT network with payments moving over a blockchain network.

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**“Traditional bankers are more disturbed by CBDCs than crypto. Crypto is material, but it is still relatively small compared to the total financial assets. It’s not big enough to threaten bank deposit bases.” - Citi**

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### **Debate About Sequential vs. Simultaneous Payments Likely to Emerge**

Faster SWIFT-enabled payments do not change the fact that SWIFT is essentially just a messaging system with the actual movement of the assets relying on other participants. Chart 4.3 illustrates the sequential nature of SWIFT interactions.

The *instruction* and the *asset* move separately. The receiving counterparty sends their details and instructions to the SWIFT network and SWIFT relays that information to counterparty that will be making the payment. That counterparty then in turn uses SWIFT to instruct their payment agent to send the money to the receiving account. At that point, the money transfer is batched up with all the other payments that will be made between those two counterparties for the day and sent over to be processed. Thus, each payment runs through an entire system of intermediaries. Each intermediary “adds additional cost to the transaction and creates a potential point of failure.”<sup>41</sup>

Upgrades being pursued by SWIFT, banks, and payment infrastructures in their announced strategy speed up this series of events and look to eliminate the batching process via real-time gross settlement, but envisioned changes do not re-architect the overall approach or affect the role of existing intermediaries. The new process remains sequential and intermediated. It represents a better version of an existing process.

Digital currency offerings connected to a blockchain would foundationally alter this approach. Transfers between payers and payees would combine the message and the asset movement as a *single* transaction. There would be “atomic” transfer of a stablecoin going one way and a security token another way. Each participant to the transaction would have a key they use to sign a transaction, and the veracity of which is confirmed by validator. The chain verifier would ensure

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37 “What should you know about SWIFT system transfers?”, XE, December 1, 2020, <https://www.xe.com/blog/money-transfer/what-should-you-know-swift-system-transfers/>

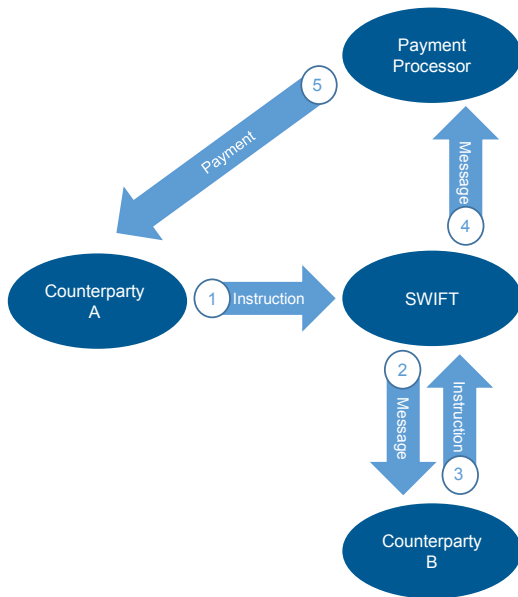
38 *ibid*

39 “SWIFT Enables Instant 24/7 Cross-Border Payments”, SWIFT, December 2, 2020, <https://www.swift.com/news-events/news/swift-enables-instant-247-cross-border-payments>

40 *ibid*

41 “How Blockchain Could Disrupt Banking”, CB Insights, February 11, 2021, <https://www.cbinsights.com/research/blockchain-disrupting-banking/>

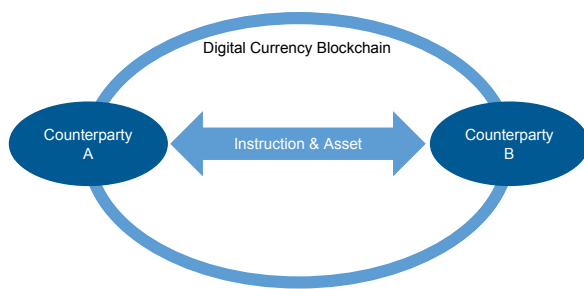
**Chart 4.3: Sequential SWIFT-Enabled Payment Processing**



Source: Citi Business Advisory Services

that the sending party had the currency available in its wallet and that the wallet address of the receiving party was valid. If these parameters were both true, the transaction would get added to the chain and money would move from the paying counterparty's wallet to the receiver's wallet immediately. Rather than a sequential, there would be a simultaneous transaction. This is shown in Chart 4.4.

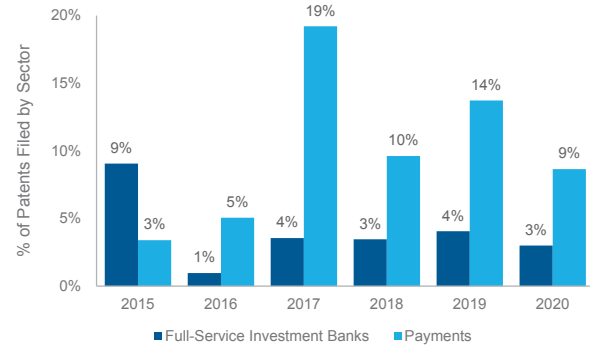
**Chart 4.4: Simultaneous Digital Currency Payment Processing**



Source: Citi Business Advisory Services

Enablement of such a simultaneous payment ecosystem is already beginning. At a macro level, payment companies are already leading the charge with regard to incorporating crypto-related innovations as part of their processes. Yewno, an AI-based data

**Chart 4.5: Percentage of Crypto Economy Related Patents Filed in Traditional Financial Sectors**



Source: Yewno, using data from World Intellectual Property Organization (WIPO) and the US Patent and Trademarks Office (USPTO)

analysis provider that leverages its proprietary knowledge graph to identify novel relationships between a variety of concepts based on news and patent filings, worked with Citi Business Advisory Services to look at patent trends amongst payment companies and investment banks. It found that payment companies held a significantly larger percentage of patents compared to full-service investment banks, signaling the higher level of innovation pursued in this realm. This is shown in Chart 4.5.

A group of 15 financial institutions have formed Fnality to create a payment solution to enable on-chain settlement between financial institutions using digital cash deposited at central banks. Their current planned currencies are the US dollar, Euro, British Pound, Canadian Dollar and, Japanese Yen. Their goal is to launch a wholesale stablecoin in 2021.<sup>42</sup>

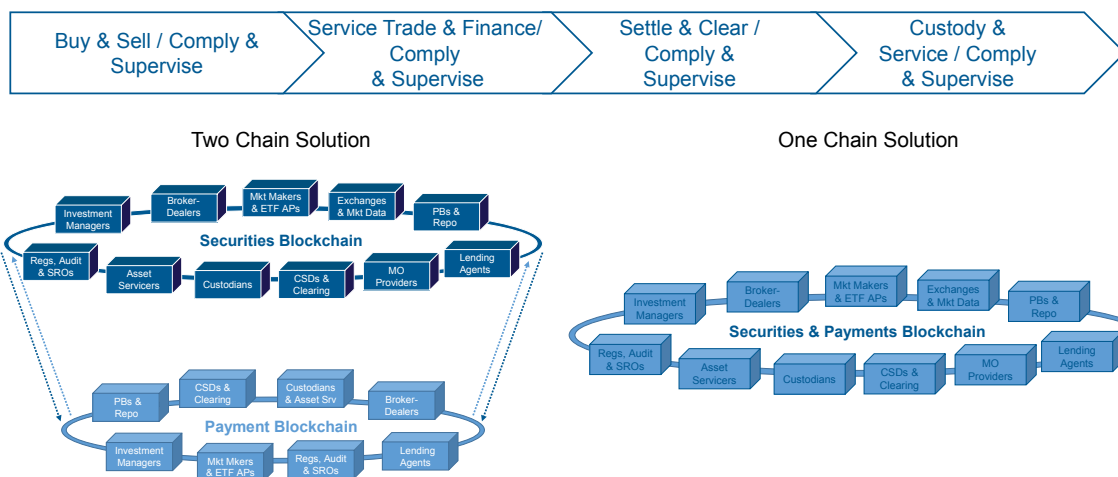
In April 2021, J.P. Morgan, DBS, and Temasek launched a new technology company, Partior, and announced plans to develop an open architecture blockchain payments platform and to digitize commercial bank money. The genesis of the idea originated from Project Ubin, a public-private blockchain initiative and CBDC experimentation sponsored in part by the Monetary Authority of Singapore.<sup>43</sup> In describing the initiative, the CEO of DBS said, "The current hub and spoke arrangement in global payments often results in delays as confirmations from various intermediaries are needed before a settlement is treated as final. This in turn has a knock-on effect and creates inefficiencies in the final settlement of other assets. By harnessing the benefits of blockchain and smart contracts technology, the Partior platform will address current points of friction."<sup>44</sup>

42 "Fnality Won't Launch Global Payments Solution This Year", Ledger Insights, September 9, 2020, <https://www.ledgerinsights.com/finality-global-blockchain-payments-solution-next-year/>

43 "J.P. Morgan, DBS and Temasek to Establish Platform to Transform Interbank Value Movements in a New Digital Era", JP Morgan, April 28, 2021, <https://www.jpmorgan.com/news/dbs-jpmorgan-and-temasek-to-establish-platform>

44 ibid

Chart 4.6: Re-Envisioning Investment Management Lifecycle with Securities & Payments Blockchains



Near Simultaneous Movements of Securities & Payments

Source: Citi Business Advisory Services

**“Being able to move away from the old cross border payments and being able to get off SWIFT and FedWire would be huge. It makes existing data on the DLT networks more powerful.” - Global Asset Manager >\$1 trillion AUM**

**“The challenge with SWIFT is it’s a relic of the 1970s. If you were in banking in the 1950s-1960s it was a Telex message. However, SWIFT is a messaging system and it’s not actually sending money, and the banks have to settle afterwards. In Bitcoin, the message and the value is the same thing.” - Citi**

### Change in Payments Approach Could Trigger Movement to Tokenize Securities

While just being planned at this point, the potential for digital versions of fiat currencies and a new global blockchain-based payment network might go a long way toward bringing at least a portion of the securities processing ecosystem into alignment with the crypto model, allowing greater interoperability between cryptocurrencies, private network coins, and CBDCs. Moreover, the transformation of payments could be the trigger that prompts the industry to re-evaluate and foundationally alter the way that securities processing works and that breaks down the current reluctance to tokenize securities. In part, the impetus to reconsider the securities side of the ecosystem would come from the difficulties that the industry might face in trying to operate a split approach. We examine these below.

### Discrepancies between Payments and Securities Processing Would Stress Existing Model

Just as the SWIFT network that facilitates the settlement of securities-related payments is based on a sequential series of events, the interactions that govern the processing and movement of securities are based on a similar, and even more complex, series of sequential interactions and hand-offs. The same concerns driving changes in the payment approach – needing confirmations from various intermediaries, dealing with knock-on effects and creating inefficiencies – hold true for securities processing.

If one part of the processing universe were to upgrade and another did not, the efficiencies and risk-improvements from changing the payment approach would be lost. Moreover, separating the movement of securities and the accompanying payments would create new risks and concerns.

Today, there are linked activities between securities and money movements at multiple points in the value chain. Borrowing a security to cover a short requires an accompanying movement of money; doing a financing trade requires a movement of money or collateral; maintaining a derivative trade requires at least daily adjustments in the amount of money or collateral being held as margin; settling a securities transaction requires delivery of payment to transfer ownership; applying certain corporate actions requires both security-related and money-related activities.

In today’s sequential approach, this exchange of money, securities and collateral does not happen at a trade-by-trade level, but typically happens only periodically for most processes (e.g., at the end of a trading

session or overnight) when all the interactions for the day between the counterparties have been concluded and the net movements can be determined.

If payments can be done simultaneously and near real-time, but securities instructions and movements are following the normal batched and netted processing approach, two outcomes may result.

- **A Slower, Less Efficient System:** Today, for transactions that link the movements of securities and monies, the work streams typically happen in parallel. If they both go off without a hitch, the two outputs are checked against each other before there is a final sign-off on the transaction. If one or the other looks wrong, an exception is generated and investigated and the transaction is put on hold. In a blockchain-based system, there is no payment work stream. The payment only takes place if the money to be sent is already in the wallet of the initiating party and since all counterparties would be on the chain and able to see the entire set of wallet holdings, the receiver of the payment will know that the funds are available. Yet, to know the status of the security leg, the transaction would have to be instructed, acknowledged, initiated, and completed. The payment transaction would have to wait for this sequential process to conclude before being initiated. Thus, instead of happening in parallel, the payment itself would become an additional sequential step in the process.
- **More Risk and Friction:** Waiting for confirmation about the securities' status to initiate the movement of monies may not be the only new step required. Participants would have to determine ways to synchronize the sequential and near-real time activities. For example, in a delivery-versus-payment (DVP) transaction, rather than waiting for the payment to be initiated or confirmed, the ordering of the transaction may need to reverse. The securities may need to be moved first and held in an interim account in order to trigger the payment. This may require not only a reworking of the current approach, but potentially additional checks to see if the security were in the holding queue and whether it had been released when the payment instruction went out. Any addition of steps create a new potential points of failure, increasing the risk and the friction in the system.

Given these complexities, it is unlikely that a split securities and payment process would be deemed acceptable. Once payments are seen moving to digital currencies and blockchain, efforts to tokenize securities and move them onto their own blockchain, or onto the same

blockchain as payments, are likely to begin in earnest so that both processes would be working once again on a synchronized timeframe as shown in Chart 4.5.

**Experiments on how to simultaneously move security and payment tokens have already begun.** Project Jasper III by the Bank of Canada looked at the exchange of a securities token issued by Canada's Securities Depository and cash tokens issued by the Bank of Canada over a single blockchain. The work confirmed that they could enable DVP via a "Token-versus-Token" (TVT) approach. In December 2020, the Swiss SIX digital exchange completed Phase 1 of Project Helvetia that performed a proof-of-concept exchanging wholesale CBDC for the settlement of tokenized assets on a single blockchain.<sup>45</sup> Project Stella sponsored by the European Central Bank (ECB) and Bank of Japan as well as Project Ubin III by the Monetary Authority of Singapore and Bank of Singapore tested TvT across separate cash and securities blockchains. In both projects, the tokens were locked on their respective ledgers and sequentially released to their new owners using smart contracts.<sup>46</sup>

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**"Settlement and clearance, issuance and trade and financing will eventually all have a crypto counterpart. In the beginning it would be spot markets. But gradually we are going to see these established financial instrument have their crypto counterparts." - Blockchain / Crypto firm**

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**"I think clearly we are in a very early stage of CBDCs and it is a transformative journey for the world. The technology has the potential, can help eliminate cost from the back office. There is certainly a momentum building out around CBDCs." - EMEA Hedge Fund**

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**"From a cash perspective, we're limited as there aren't CBDCs, or official stablecoins that can be used by major financial institutions. That limits what we can do and how far we can move." - Global Asset Manager >\$1 trillion AUM**

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### **Projects to Explore Re-Architecting the Securities System to Operate on Blockchain Have Begun**

In September 2020, the European Union put forth a proposal for a pilot regime for market infrastructures

<sup>45</sup> "Project Helvetia—Settling Tokenized Assets in Central Bank Money", SDX, December 3, 2020, <https://sdx.com/news/project-helvetia-settling-tokenised-assets-in-central-bank-money>

<sup>46</sup> "On the Future of Securities Settlement, BIS Quarterly Review", Morton Linnemann Bech, Jenny Hancock, Tara Rice and Amber Wadsworth, BIS, March 1, 2020, [https://www.bis.org/publ/qrtrpdf/r\\_qt2003i.htm](https://www.bis.org/publ/qrtrpdf/r_qt2003i.htm)

based on distributed ledger technology (DLT), also known as PilotR.<sup>47</sup> This initiative takes a regulatory sandbox approach for the European Single Market, offering firms a set of exemptions from EU financial law and allowing them to test DLTs in certain activities related to trading, clearing and settling. Besides offering room for experimentation, the PilotR Proposal supports the education of EU regulators, potentially forming the basis for foundational changes to EU law.<sup>48</sup>

The PilotR proposal identifies two types of distributed ledgers (blockchains): a DLT multilateral trading facility (DLT MTF) operated by an investment firm or market operator, and a DLT securities settlement system operated by a central securities depository (CSD).

They split the market in this way by noting that “the use of distributed ledger technology, with all transactions recorded in a decentralized ledger, can expedite and condense trading and settlement to nearly real-time and could enable the merger of trading and post-trading activities. However, the current rules envisage the performance of trading and settlement activities by separate market infrastructures.”<sup>49</sup>

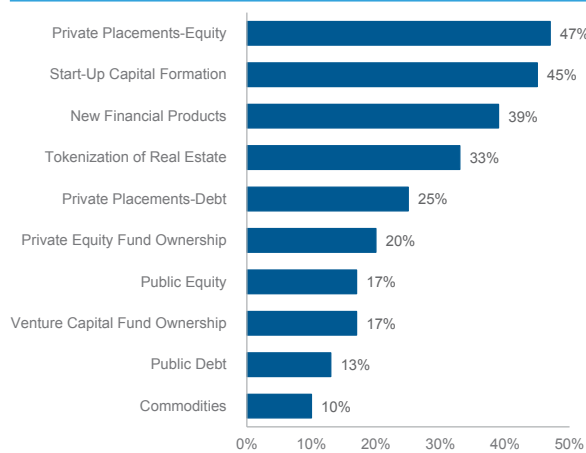
They note that while financial instruments transacting via a trading venue today have to be recorded with a central securities depository (CSD), going forward a distributed ledger might be used as a decentralized version of such a depository. In such a case, they spec-

ulate that it might be justified to allow a DLT MTF to perform some of the activities normally performed by a CSD. These might include ensuring the initial recording of DLT transferable securities, the settlement of transactions in DLT transferable securities against payment, and the safekeeping of DLT transferable securities or where applicable, related payments, and collateral.<sup>50</sup>

This vision would blur the lines between trading and settlement activities and allow DLT MTFs to potentially offer a broader set of services. In their view the DLT securities settlement system would just handle the settlement of transactions in DLT transferrable securities against payment.

In the US, experimentation has come from the CSD side of the equation—namely the Depository Trust and Clearing Corporation (DTCC). In May 2020, the DTCC announced Project Ion, a blockchain-based platform that would enable contraction of the settlement cycle from T+2 to T+1. In February 2021, they announced that they would be completing their prototype in the early part of 2021, using this blockchain foundation as the first of a 3-stage approach that would allow for transition of the settlement model by 2023.<sup>51</sup> Additionally, Paxos, Instinet, and Credit Suisse together utilized blockchain technology to achieve same-day settlement for a selection of U.S. equity trades.<sup>52</sup>

**Chart 4.7: Best Applications for Security Tokens**



Source: Greenwich Associates 2019 Blockchain Study, <https://www.r3.com/wp-content/uploads/2019/10/R3.Tokenization.Financial.Market.Securities.Oct2019.pdf>

*“I think regulators will help answer all of the questions around the digital space. I am hopeful for a global standard framework being developed sometime in the future around digital assets space.” - EMEA Investor*

*“The new EU regulations for crypto assets is a good beginning and solves a lot of the issues but spreading this to a global level is still difficult and would take a lot of time. The EU regulations even tackle tokens that aren’t securities or commodities. NFTs would fit into this category as an Asset-Backed Token.” - Blockchain / Crypto firm*

47 “European Union Proposal for a Pilot Regime for Market Infrastructures based on Distributed Ledger Technology”, September 24, 2020, <https://ec.europa.eu/transparency/regdoc/rep/1/2020/EN/COM-2020-594-F1-EN-MAIN-PART-1.PDF>

48 “The DLT Sandbox Under the EU Pilot Regulation”, Dirk a Zetsche, University of Luxembourg Law, April 25, 2021, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3833766](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3833766)

49 On the Future of Securities Settlement, BIS Quarterly Review”, Morton Linnemann Bech, Jenny Hancock, Tara Rice, and Amber Wadsworth, BIS, March 1, 2020, [https://www.bis.org/publ/qtrpdf/r\\_qt2003i.htm](https://www.bis.org/publ/qtrpdf/r_qt2003i.htm)

50 ibid

51 “DTCC Outlines Two-Year Roadmap for Transition to a Shorter Settlement”, Jonathan Watkins, The Trade News, February 25, 2021, <https://www.thetradejournal.com/dtcc-outlines-two-year-roadmap-for-transition-to-shorter-settlement/>

52 Paxos Trumpets Same-Day Shares Settlement Using Blockchain, Ian Allison, CoinDesk, April 6, 2021, <https://www.coindesk.com/paxos-same-day-shares-settlement-blockchain>



### **Tokenization of Securities May Soon Follow**

As efforts to rethink the future of securities processing progress, discussions on what securities to tokenize have also begun. Initial interest has focused on illiquid instruments as noted in Chart 4.7 that shows the results from a 2019 Greenwich Associates blockchain study.

Private equities and start-up capital formation were seen as the two best applications for securities tokens across the survey universe with close to half of all respondents ranking these offerings in the top 3 opportunities. In contrast, only 17% of respondents ranked public equities in their top 3 and only 13% selected private debt.

In line with these results, DTCC launched Project Whitney in tandem with their Project Ion announcement in May 2020. Project Whitney looks to explore the potential for asset tokenization and the digital infrastructure to support private market securities, from issuance through to secondary markets trading.<sup>53</sup> In a similar vein, the EU PilotR initiative states that “the type of transferrable securities admitted to trading on a DLT MTF or recorded in a CSD operating a DLT securities settlement system should be limited to securities such as shares and bonds that are not liquid.”<sup>54</sup>

While private securities may be where the interest in tokenization begins, pressures to extend the tokenization of securities to at least publicly traded equities may soon emerge. As noted earlier, there are starting to be blockchain-based instances of tokenized equity securities—the collateralized security tokens trading on Binance and FTX and the synthetic stock tokens trading via the Mirror protocol. These launches in just the past few months may be a warning flare for the industry. In both instances, traditional listed securities are being translated into tokenized instruments and traded at zero commission in the crypto domain.

While the number of such names is still quite limited, the emergence of this model creates a risk that the trading of such assets on the blockchain may draw liquidity away from the traditional market. The names being targeted for pilot launches are among the most widely traded by retail participants including Apple (AAPL) and Tesla (TSLA) and those most closely linked to the crypto domain—Microstrategy (MSTR) and Coinbase (COIN).

Though meant to be tracking traditional instruments, a noticeable shift in liquidity to blockchain-based offerings could create arbitrage opportunities and increase the number of securities being listed on-chain. As noted in Section I, retail participants are the primary participants in crypto trading and a more aggressive minority have shown their interest in combining their investment power to generate “crowd” effects in traditional securities like Gamestop. Growing interest in tokenized equities from this cohort might combine with advancing

confidence in new blockchain based securities processing platforms to shift and expand industry priorities.

Successful launches of private equity or illiquid security tokens in the TradFi world and strong uptake of tokenized equity products in the crypto domain might thus provide the pathway to tokenization of a broader set of securities. Together with tokenized physical and digital assets, this development might create the potential for a new approach to and view of asset management.

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***“On tokenization, I think we often overestimate what will happen in one year, but we underestimate what will happen in 3 years.” - Blockchain / Crypto firm***

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***“The security token world is still unproven. We are still lacking the system for blockchain to tokenize the traditional securities. There are private issuances being done on the platform somewhere but not really the public issuances. There would certainly be some changes to that in the near future because the blockchain platform is very efficient but we are still a long way to see tokenized financial instruments in reality.” - Blockchain / Crypto firm***

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***“The retail story for tokenization is about access and for institutions it’s more about efficiency. Generally, institutions get access to most investment types. If you tokenize VC, PE, and other alternatives it’s a whole new world for retail.” - Global Asset Manager >\$1 trillion AUM***

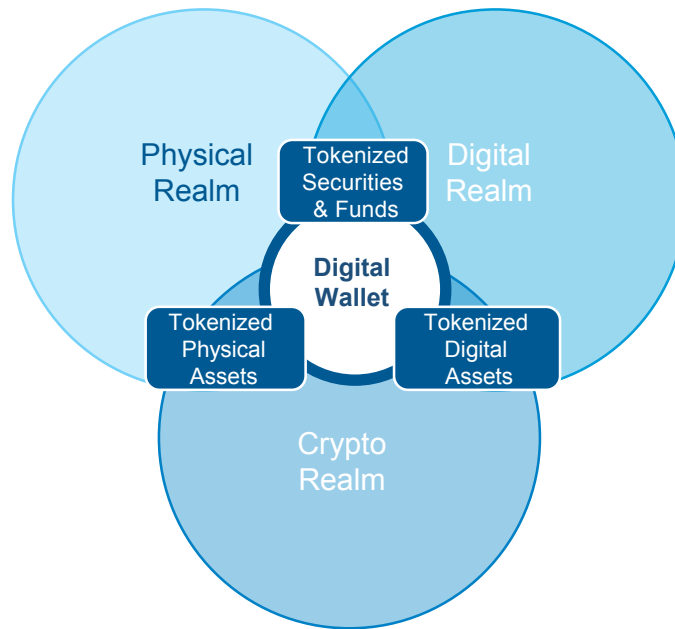
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### ***The Future of Investor “Portfolios” May Be Tokenized Assets Held in Digital Wallets & Emerging Focus on “Ownership Optimization”***

Tokenization of securities may prove to be the bridge that brings the TradFi and NewFi worlds together as shown in Chart 4.8.

Shifting security exposures to a tokenized format means that those assets can now be held in digital wallets, ending the account vs wallet split that made the various investment domains incompatible. This development could transform the way in which sell-side participants can interact with the assets and how investors can utilize their securities, allowing both groups to adopt models currently only available in the crypto domain.

Chart 4.8: Completing the Bridge Across Physical, Digital, & Crypto Realms



Source: Citi Business Advisory Services

### ***New Opportunities to Port DeFi Models to Tokenized Securities Assets***

New types of protocol-based applications might be built using smart contracts. These could include enhancements of current processes, automation of more types of tasks, or entirely novel models of engagement, paving the way for a new era of innovation in the industry. The range of these potential innovations is vast.

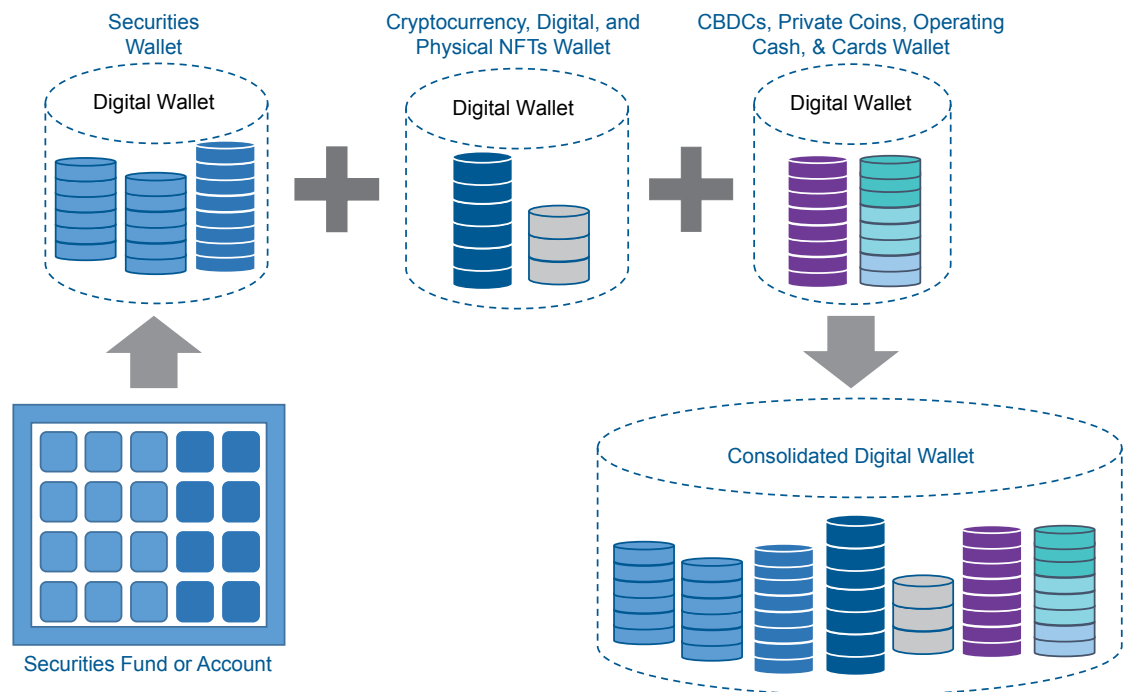
- Broker-dealers could transform many of their current processes into protocols with their own proprietary coins that clients purchase to access and utilize the services. Use cases might include allowing investors to offer liquidity to automated market makers to perform their own FX hedge transactions; facilitating investors' ability to self-manage their own borrowing and lending of securities; automating the ETF create and redeem workflows to operate more like stablecoin minting and issuance; or adapting margin and collateral processes to work more like staking.
- New transactional models could be introduced. Flash loans could offer a new template to enable arbitrage trading across a growing number of liquidity pools or to re-envision how repo transactions might occur. Deal-specific coins could be created to raise capital for structured products or loans, thus allowing broader participation and lower buy-ins. Private fund tokens could become the basis for new

types of ETFs, offer new sources of collateral and enable new financing and lending services if secondary trading takes off in these instruments.

- Smart contracts could be embedded in a whole variety of investment instruments allowing for the automated execution of key tasks. Oracle networks could be developed to look-up and deliver the inputs required to trigger actions described by the code. Option, warrant, and convertible bond contracts could be re-written to have elections be self-managed by the token holder. Derivative contract margin calls and structured loan covenants could be auto-executed based on changes in key terms or conditions (e.g., credit or ESG ratings). Notifications and elections for corporate actions could be administered directly with the token holder.

Just as electronification changed the industry's trading landscape and the introduction of cloud-based architectures, big data and the AI toolkit transformed the analytic approach, the tokenization of securities, and introduction of Web 3.0 primitives, protocols, and distributed ledgers are likely to trigger yet another foundational re-think about how the industry operates. Innovative transactions and services may also expand to include a broader set of assets. The key to this is digital wallets.

Chart 4.9: Expanding the “Wallet” Concept to the Entirety of an Investor’s Assets



Source: Citi Business Advisory Services

*“If you have a derivative instrument on the ledger and you have a cash program to operate according to that lifecycle then the whole thing looks automated. That would also be a catalyst for other assets to be tokenized.”*  
 - Global Asset Manager >\$1 trillion AUM

*“Before the barriers to risk taking were capital and risk calculating, but now the protocol gives the infrastructure and the smart contracts provide risk mitigation. I think DeFi blows up the centralization of expertise and capital.”*  
 - Blockchain / Crypto firm

### Digital Wallets as the New Point of Aggregation across an Investors’ Holistic Set of Holdings

To revisit and expand on a point made earlier, an investor’s digital wallet is not equivalent to an account. The wallet holds the key that unlocks access to a set of underlying assets, each of which may reside in its own ledger. In essence, the wallet is a piece of software that unifies an investor’s control of their assets and gives them a view across their pools of holdings.

Today, there are several types of digital wallets:

- **Operating Capital Wallets:** These wallets give access to a user’s operating capital. In Western nations, this may often take the form of a wallet that holds a user’s credit or debit cards (e.g., ApplePay). In other countries, the wallet is more often a direct form of access to a user’s cash account (e.g., AliPay). If CBDCs and private network coins such as Diem take off, these two models may evolve into a consolidated operating wallet that contains access to a user’s cash accounts, their cards, and their tokenized cash and payment options.
- **Crypto Domain Wallets:** In the cryptocurrency space, the wallet provides access to multiple types of exposure—payment coins, stablecoins, tokens, and NFT assets.
- **Securities Wallets:** If securities were to become tokenized, yet a third type of digital wallet may emerge that could hold a user’s securities, fund tokens, operating coins, and collateral pledges.

Today, these wallets are not interoperable. Each runs on its own software and points toward its own unique set of ledgers. In the future such fragmentation is unlikely to persist. Chart 4.9 shows how these various types of wallets may come together into a new “consolidated” digital wallet.

While this may seem simple conceptually it contains the potential to literally change the entire nature of the financial industry.

Having one, consolidated, digital wallet per individual or institution solves a number of problems noted throughout this report. As described in Section I, it would allow the individual or institution to re-aggregate their securities and investment funds with their digital and crypto asset holdings into one investment account, addressing the growing fragmentation of investment pools. As described in Section III, it would allow them to move earnings obtained by creating and managing their own tangible and intangible digital assets, or by participating in passive income opportunities, directly into their wallet, allowing for the direct deposit of that income and seamless deployment of those funds. And as described in this current section, it would allow for a broadening definition of “cash” to include not just their fiat currency buying power, but their holistic buying power across private network coins, stablecoins, and cryptocurrency payment coins. The investor’s “portfolio” would become this entire set of assets.

**Extended Range of “Assets” Creates New Opportunities and Expanded View of Asset “Management”**

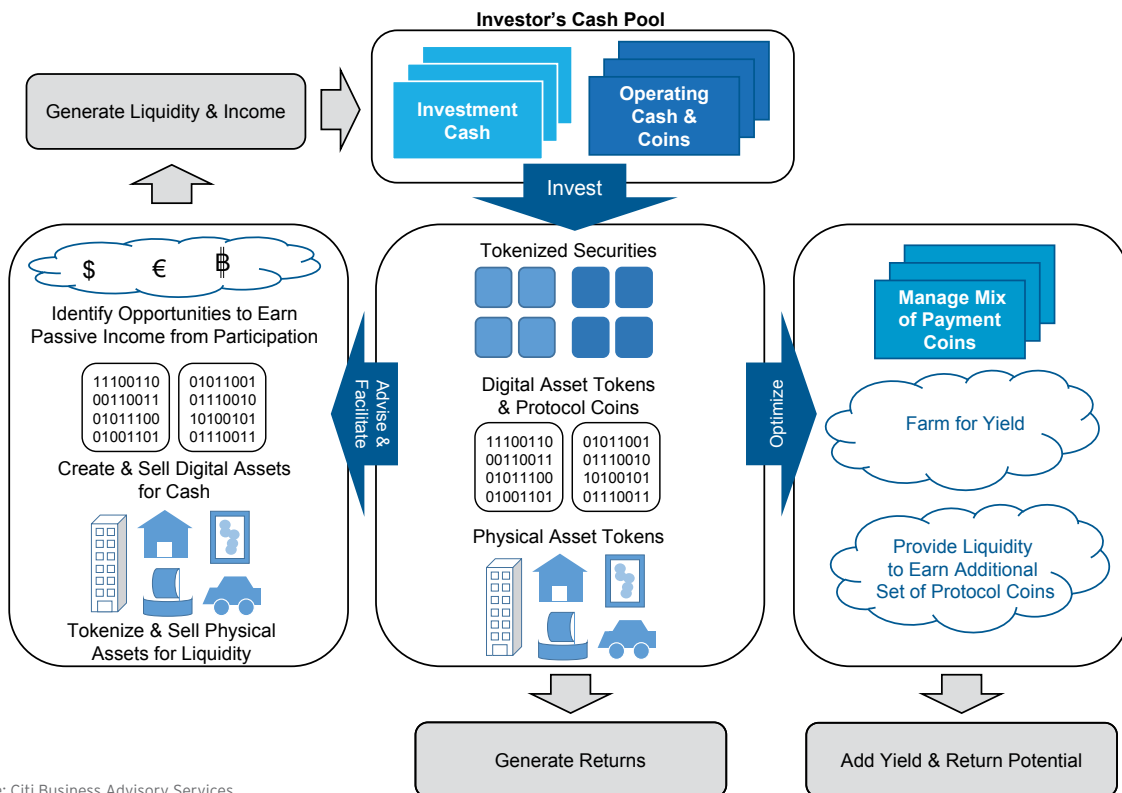
According to portfolio theory, this more diverse set of holdings would hold out the potential of a more robust and resilient portfolio with a more granular ability to balance risk and reward. Portfolio construction and risk management would need to extend to consider a wider set of holdings, and including the growing share of an investor’s cash and cash equivalents, and the income streams or liquidity that investors might be able to generate by optimal utilization of their personal assets.

Today, the only “asset” that the investment manager oversees is the individual’s or institution’s pledged investment cash and the instruments or funds that the cash is used to purchase. The future set of “assets” might include not just the investment cash and investments, but everything held in the digital wallet.

*“There is a lot of interest in the DeFi space, but it’s really hard to touch it. If I’m a wealth manager client it’s hard to participate here. Bridging between wallets and traditional brokerage accounts will be key. You need to allow people to start participating in it and feeling it.” - Alternative Asset Manager*

In essence, the consolidation of holdings into a single wallet enables an entirely new view of an individual or institution that blurs the lines between banking, wealth, and asset management. It creates the opportunity to not just manage their investments, but to optimize everything that the individual or institution “owns”.

**Chart 4.10: Model for the Future of “Asset” Management & Ownership Optimization**



Source: Citi Business Advisory Services

**In addition to managing an individual's or institution's combined TradFi and NewFi investment portfolio, new types of asset management may be possible.** These might include the following:

- New FX strategies designed to obtain incremental returns by actively managing an individual's or institution's mix of payment tokens across CBDCs, stablecoins, private coins, and cryptocurrencies; or yield farming strategies that provide high demand coins to low supply pools, be they government-backed, industry-backed, or decentralized.
- New active management strategies that examine the protocols of crypto economy players -Dapps and DAOs - and either purchase or participate in these protocols to earn native coins that are expected to increase in value over time.
- New types of advisory services that work with individuals and institutions to "create" unique assets and then offer them as investment opportunities by including them in proprietary funds or syndicating them directly to their client base. Examples could include tokenization of a client's physical as well as their tangible and intangible digital assets, or the creation of new tokens that repackage their debt obligations such as an individual's mortgage or student loan or an institution's commercial loan or supply-chain financing to create more investment dollars for their portfolio.
- Other advisory offerings that identify opportunities for investors to use their physical assets in a new or extended manner in order to generate passive income such as signing their routers onto networks like Helium to share and monetize their unused bandwidth.

Chart 4.10 illustrates this more comprehensive view of asset management and shows how interconnected all the assets in the portfolio are likely to become as ownership optimization advances. Management of assets in this context extends from simply investing to investing, advising, facilitating, and optimizing.

Just as there are self-directed investors who today manage their own assets, this entire bundle of activities may continue to be done individually in the future by an increasingly educated and risk-seeking audience, in line with how DeFi models are operating today. It is more likely, however, given the complexity of the portfolio that the majority of institutional and individual investors will continue to look to professionals to manage this complex interplay of assets on their behalf.

Given how unique each set of assets may be, this would require a degree of customer understanding and tailoring beyond anything currently envisioned by

the industry, but one that might be possible due to the unprecedented transparency of blockchain data and growing ability to exchange and model data sets without exposing the underlying data itself.

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***"In the institutional market you can make anything an asset class, so long as you can put a value on it. It comes down to the basics. There are new asset classes emerging that we have not seen in the past. How do asset managers position their product, how do they deal with newer generation, would certainly be more important in the future."* - EMEA Asset Manager <\$500 billion AUM**

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***"Blockchain can enable a lot of personalization at scale for end investors."* - EMEA Asset Manager \$500 billion - \$1 trillion AUM**

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### ***Blockchain May Enable New Insights, Partnerships, and Personalization Opportunities***

Asset managers have for some time offered the tailoring of investment portfolios for institutional investors via bespoke advisory services, and a growing set are now starting to facilitate a technology-driven form of tailoring for individual investors. Several factors have come together to enable this trend.

- (i) Managed account platforms offer operational support that is allowing the minimum account size to decrease
- (ii) Asset managers now offer extensive sets of model portfolios to meet a widening set of investor objectives
- (ii) The ability to trade fractional equity shares (stock slices) is allowing these portfolios to be applied to smaller and smaller pools of wealth
- (iv) Algorithms are being designed to optimize the holdings of these accounts around key variables such as tax exposure or values.

As discussed in our Industry Evolution reports, these developments are shifting and broadening the industry's value proposition. Whereas historically investment managers were singularly focused on their expertise in picking securities, this skill is now just one part of how firms try to differentiate their offerings. Being able to deploy the organization's portfolio construction skills to better address a client's needs and objectives is becoming another critical selling point.

At present, the manner in which asset managers align their portfolios to an individual's needs are fairly generic. Tax optimization looks at the differential between an investor's current and an envisioned future portfolio and models the best pathway to redeploy assets in order to minimize tax impacts. ESG adjustments provide either an "all or nothing" approach (e.g. ESG-aligned portfolio or non-ESG aligned portfolio) or in some cases allow investors to select from a range of benchmarks they would like to see their portfolio measured against (e.g., carbon impact or gender diversity of underlying companies). And direct indexing looks generically at different employment sectors and dials down exposure to a specific set of companies.

Moreover, the construction of the portfolio does not take into account the individual's unique profile because the asset manager does not have access to that information. Though wealth managers are increasingly outsourcing the construction of model portfolios, they are not sharing their underlying customer data. This information gap limits the degree of tailoring that can be done for the portfolio.

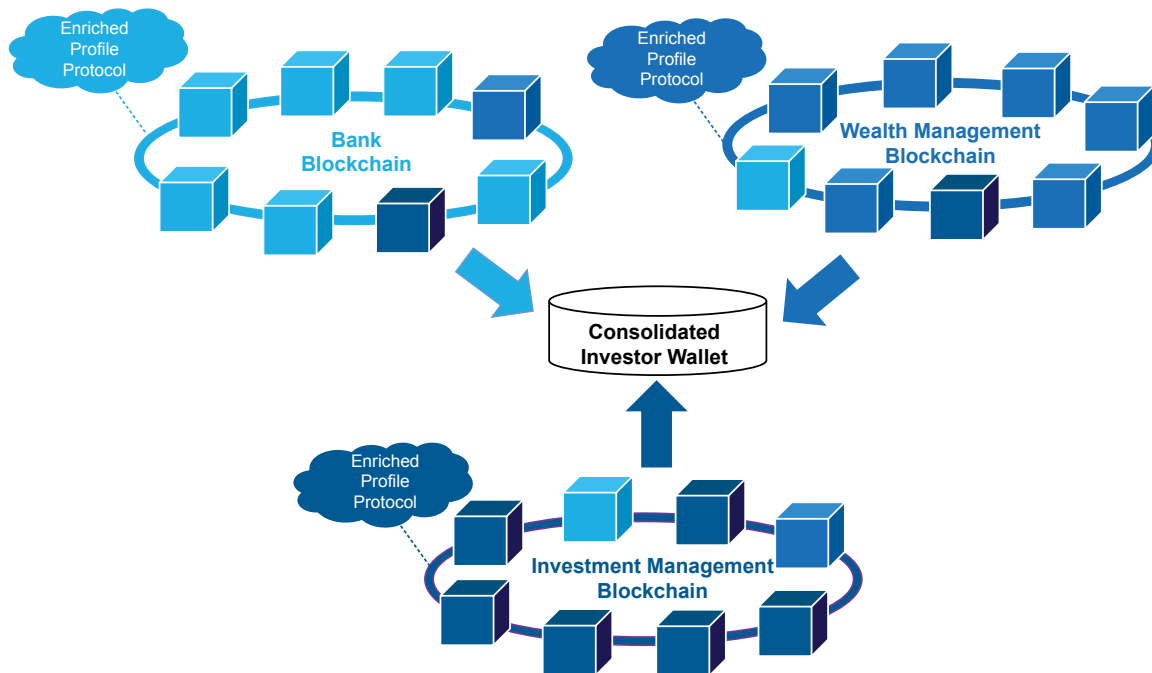
A new attitude and level of data sharing will be required if the lines between banking, wealth, and investment management are to blur as anticipated due to the aggregation of an individual's or institution's assets in a consolidated digital wallet. Holistic asset management and ownership optimization will require not just

generic, but specific information and a much larger set of data to model and service the investor. Three factors are likely to facilitate greater partnering to provide the required elements:

- (i) Transparency of blockchain data: All the information in a blockchain ledger is replicated and shared across every node on that chain. This means that any participant can see all of the transactions, holdings, and details for every wallet engaged in the ecosystem.
- (ii) Pseudo-anonymous addresses: Each node has identifying information, but such information is not tied to the wallet owner's personal identity.
- (iii) Privacy-preserving analytics: A new way of deriving insights from encrypted data is emerging and being used to facilitate secure data sharing. Advanced mathematical and cryptographic techniques (homomorphic encryption) enable the analysis of proprietary data without providing the modeler access to the data itself. This enables sensitive information to be kept anonymous, but still be used to facilitate targeted processes like personalization.

Information required to drive holistic asset management and ownership optimization could thus be shared across the three types of financial industry partici-

Chart 4.11: Creating a View into an Investor's Holistic Set of Assets & Personal



Source: Citi Business Advisory Services

pants. Banks, wealth managers, and investment managers could each become nodes on each other's chains and offer protocols with an enriched set of encrypted wallet-linked profile information that the other entities could purchase with a native token. This is illustrated in Chart 4.11 and described below:

- *Bank Contributed Data:* Wealth and investment managers could participate as nodes on a bank's blockchain to see the wallet-level holdings of CBDCs, stablecoins, private network coins, and cryptocurrencies. They could purchase encrypted data for a specific wallet address showing KYC/AML sign-offs, non-tokenized deposit balances, credit lines, spending patterns and liabilities and import that into their modeling environment.
- *Wealth Contributed Data:* Banks and investment managers could participate as nodes on a wealth manager's blockchain and to see wallet-level holdings of individually-held tokenized digital, physical, and security holdings, and un-deployed investment "cash" across CBDCs, stablecoins, private network coins, and cryptocurrencies. They could purchase encrypted data for a specific wallet address showing risk tolerances, sources of income, non-tokenized assets, investment horizon and objectives, and personal details (e.g., age, profession, number of dependents) and preferences (e.g., ESG priorities, charities).

- *Investment Manager Contributed Data:* Banks and wealth managers could also participate as nodes on an investment manager's blockchain and see wallet-level holdings of tokenized securities and funds, digital and physical asset portfolios, tokenized collateral holdings and un-deployed "cash" across CBDCs, stablecoins, private network coins and cryptocurrencies. They could purchase encrypted data for a specific wallet address showing returns, cash flows, and terms for all investment, collateral, and digital asset agreements.

Each set of financial industry participants would thus be able to determine the services they are best suited to provide in the holistic management of the whole set of assets, model how their offering would impact the individual's or institution's overall portfolio, and compete to win the customer's business. Such competition may occur by offering the best protocols and getting others to use their capabilities or by aggregating the best of other entities' protocols alongside their own core offering and composing a new value proposition that positions the entity as the customer's access point.

Section V explores the ways in which investment managers may need to broaden their value proposition and re-architect their organizations to navigate this new competitive landscape. We examine the implications for the economics of firms and for the structure of the industry of the technologies described in this and preceding sections. Competition for firms in the future is likely to look very different from today, and with it what is needed for success.

## Section V: Asset Management in the New World

**A wave of technological change and financial innovation is underway, but thus far, activities are originating outside of the investment management industry and away from the majority of FinTech players as both sets of participants continue to be focused on enhancing the TradFi approach. Views that there is bias toward institutions and wealthy “insti-viduals” in accessing investment opportunities is pushing a growing set of individuals to digital and crypto models that sit outside the current ecosystem. Managers’ historically privileged position of having exclusive access to industry infrastructure, information, and expertise is poised to erode.**

The weight of the extraordinary technological, market, and economic changes addressed in preceding sections suggest that investment managers are unlikely to remain competitive by doing what they have successfully done in the past. By now, this should be a recognizable truth.

The industry has already experienced multiple realignments caused by technology in just the past 20 years: the electronification of trading and emergence of new investment strategies; advancements in processing volume and speed that enabled the equitization of fixed income as well as factor decomposition and the accelerated growth of smart beta, thematic, and ESG index funds; the emergence of AI tools able to extend investment models to new unstructured data inputs; the scaling of industry delivery options to enable a move from funds to widespread use of managed accounts.

Just as technology drove those changes, the technology powering the crypto ecosystem may unleash a whole new set of dynamics that will drive even more profound changes in the future.

Managers may begin to adopt aspects of crypto technology and operating models, enabling an entirely new approach and industry dynamic. Today’s efforts at process optimization and determining the right balance of man versus machine at a task level may extend into the creation of protocols and specialized investment management Dapps in the future. This may allow a wider range of investment managers to participate in value creation and blunt some of the benefit that having a broad investment and solution platform provides in today’s landscape.

Success in the future may coalesce around those firms that are early to market and able to draw users into their community, thus creating their own network effect and benefit from “virality”. New revenue models may emerge to both reward the provider

and incentivize participants in such a system. More “coopetition” may result as a growing set of services would be required to manage the comprehensive set of assets that may soon be held in an investor’s consolidated wallet. Industry players may look to mutualize some of the benefits of participation and create a voice in each other’s development through new types of governance arrangements.

Determining how to play in the emerging landscape may create new roles and opportunities, but recognizing how disruptive those coming changes may be is a critical first step.

### The Landscape of New Strategic Threats

Historically, investment management firms leveraged their privileged position, having exclusive access to industry infrastructure, information, and expertise. This ability to monetize their position as gatekeepers has been rapidly eroded as technology democratizes access to the knowledge and inputs that drive the investment process, and traditional investment management functions and services become increasingly commoditized and difficult to differentiate between.

The upshot of the current foundational changes in technology is that managers run the risk of finding themselves with an outdated value proposition as the crypto, DeFi, and digital worlds evolve around them. The danger is that this ground, once lost, might be difficult to regain.

There are three dimensions to the threat facing the investment managers:

#### **New Assets:**

In the past, when nearly all investment dollars were flowing into equity and bond markets, competition was about outperforming to win a larger slice of the pie. This began to change as alternative strategies drew a growing share of assets, forcing investment managers



to expand their product range. A second wave of re-allocation has occurred as index funds and ETFs shifted the dynamics behind portfolio construction, benefiting those firms able to operate low cost beta operations at scale.

Today, the emergence of new tradeable and investible assets means the addressable pie itself is *shrinking*, as investors begin to funnel money and attention away from traditional markets and assets. This is especially true for the “fin-dividuals” that feel boxed out of many traditional market opportunities. Younger investors dominate this category and behavioural changes at this point in their lives may have lasting implications, particularly if they are able to transition into the “creators” envisioned in Section III. The danger for managers is not so much that they will lose market share as that they will lose *relevance*.

Managers will almost certainly have to evolve their traditional investment skills and capabilities to enable their application across a much wider range of assets, many of which are fundamentally different in their operation and dynamics. The need to understand the new engines of wealth generation and to manage those new assets—where value is driven by factors that may not be adequately captured by traditional models—will spur innovation in valuation and risk modelling.

### **New Technology:**

The economics of the traditional business model may need to be re-evaluated and current initiatives examined in a new light. Much of the industry is still transitioning from proprietary to cloud-based infrastructures, and the rollout of AI tools and new data sources is not yet embedded in many organizations. Moreover, many have allocated significant resources to reduce operational costs and inefficiencies through automation and orchestration, and in many firms those efforts are just ramping up.

Yet, plans that address and optimize for frictions inherent in the system today may prove short-sighted as those frictions may be reduced by new solutions and as a different set of concerns emerge about how to navigate between traditional, digital, and crypto investment ecosystems. This may require different infrastructure, operating models, and value propositions.

The uncontrollable focus and pace of external innovation coming from the crypto domain are *inherently* disruptive by nature, taking as its starting point what is technologically *possible* rather than permissible within current regulation. It is driven by a completely different vision and set of values. With the emergence of DeFi Dapps and their underlying protocols, developers have already shown how key financial functions can

be isolated from a sponsoring institution and enabled in a decentralized peer-to-peer environment. Much of this innovation to date has focused on bank or brokerage functions but a path toward the decomposition, repackaging, and decentralization of investment management capabilities may be only a matter of time. Unlike the FinTech developments of recent years, it may be difficult for existing investment managers to participate in this new ecosystem without foundationally altering their approach and delivery of services. FinTech players by and large have focused on improving what already exists and doing so through traditional corporate structures that allow for partnership or acquisition. Crypto developers are looking to unchain the delivery of services from any centralized sponsor and the ecosystem they are developing encourages participation, but not ownership.

The value of proprietary offerings may need to be rethought against that backdrop. Technology-driven economics may force managers to concentrate on their IP and exit areas where differentiation is low or non-existent. Determining how to participate while still maintaining an organizational edge will become a growing challenge. Managers unable to stay abreast of and find ways to benefit from the advances in industry technology and the evolution of its infrastructure may find themselves increasingly vulnerable without even recognizing the threat as their offerings become isolated pools in an increasingly decentralized landscape.

### **New Entrants:**

Managers might face only a limited threat to their core investment skillset in the evolving landscape and instead see competition emerge from new sources where providers can simply subsume the delivery of investment expertise within their broader offering that provides superior client engagement and/or more effective technology.

As the entirety of an individual's, institution's, or company's assets become fodder for their wealth creation, the importance of data will grow. Understanding of an investor's needs, preferences, and behaviours may be supplemented with modelling of their unique assets to understand passive income, tokenization, and optimization opportunities. This is true of both retail and institutional investors. Achieving such a vision might require a much more intertwined set of interactions that blur the lines between banking, wealth management, investment management, and even commerce and consumerism.

New entrants into the value chain may come from *outside* the industry. Having better data and engagement platforms might position new types of intermediaries to be better suited to enable the client relationship and direct their activities, attention, assets, and capital

in the future. This would be especially true if there is a move to re-balance the economic relationship between digital platforms and users to allow for more mutualisation of benefits as described in Section III.

Historically, the investment management industry has manufactured and sold products. The move to solutions and model portfolios marks a shift to offering their expertise as a service. This disassembly of what “expertise” means may continue as it becomes possible to package and deliver even more discrete parts of the investment management process as unique offerings.

A move in that direction might open up new models of engagement and opportunities to partner in novel ways both within the industry and with non-financial firms that already have the required level and frequency of customer engagement. This could be especially true as technology such as homomorphic encryption enables analysis of data without that data being revealed (e.g., pseudo-anonymous data sharing).

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***“In 10 years’ time I don’t think our business will look anything like what it does today. The challenge for asset managers is to make a leap and think that existing dynamics will disappear... I think we are moving very quickly to the inflection point, and when that happens, only a handful of managers are going to survive.” - EMEA Asset Manager \$500 billion - \$1 trillion AUM***

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***“Asset and Wealth Managers need to be relevant in a new world, but they’re also the firms that can leverage the technology to find alpha.” - EMEA Hedge Fund***

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***“There is a big overlap of disruption that we need to be aware of among assets managers and wealth managers. If we are not thinking through the threats we are going to be behind.” - NAM Asset Manager <\$500 billion AUM***

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***“I think the danger is not that we lose market share but that we lose relevance.” - EMEA Hedge Fund***

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## **Leveraging New Building Blocks to Compete in a Transformed World**

As outlined in Section II, cornerstone aspects of the technology underpinning cryptocurrencies—**primitives, protocols, Dapps, utility, and governance tokens**—may all become mainstream just as blockchain is beginning to be more widely incorporated.

While associated with cryptocurrencies today, these are actually the enablers of Web 3.0. Just as cloud technologies were originally associated with digital platforms like Google and Amazon before moving into the mainstream to be used across industries, these foundational elements of the crypto domain are likely to migrate as well. These building blocks might represent an entirely new opportunity set across which to architect investment management and to design new comparative and competitive advantages.

The key to unlocking their potential will be the movement away from today’s fragmented industry ecosystem to a more streamlined and common set of platforms that leverage blockchain technologies, central bank digital currencies (CBDCs), and the full set of tokenized assets—securities, digital, and physical.

## **Standardizing the Industry Infrastructure**

As described in Section IV, industry blockchains are already emerging in key areas such as structured products and commercial paper and proofs of concept are occurring around the settlement process. Such experiments are not moving the industry to be decentralized as is the case in the public chains, but rather to be better networked on common private platforms able to handle transactions in a more streamlined and efficient manner.

As this trend advances, expanding to more investment products and encapsulating more infrastructure, the industry should be able to coalesce around a new infrastructure. Just as Ethereum did, it may then be possible to create a development toolkit around these platforms and thus start to share a unified coding language and standardized versions of key programming tools like smart contracts and decentralized oracle networks. Instead of *connecting* to the key networks and platforms required to run the financial ecosystem, firms might become nodes and be fully *integrated* into the system, allowing for a degree of standardization unimaginable in today’s approach.

If such a scenario unfolds, *primitives* are likely to become the “atomic unit” for the construction of services on these new industry platforms. Already today, there are key tasks that are performed by every single industry player within the financial domain that are being done inconsistently across not only different participants, but even at times within the same organization. Some simple but meaningful examples include

“identify security”, “look up quote”, and “access interest rate”.

Working off the same platforms would enable participants to begin to agree upon, create, and use these standardized elements more easily. Plugging the actual code of these primitives into their processing would allow for firms to interoperate with one another. This makes the development of *protocols* that build off these primitives easier to accomplish.

At one end of the spectrum, protocol creation may allow for today's processes to be re-envisioned and delivered more effectively. The industry may be able to come together and offload utility tasks to common protocols. The composability of these protocols that allow developers to connect them together like Legos could allow for seamless integration of core processes across players. Examples include items like KYC/AML, margin calculations, and the application of corporate actions—all points of friction in today's environment.

At the other end of the spectrum, each investment manager may be able to look at and monetize their unique sources of value creation by translating those processes into protocols. Within the manager's organization, those protocols would become valuable pieces of IP just as Amazon's personalization algorithms or Google's search algorithms are today. How they operationalize and monetize those protocols to capture their full value may become the root of future industry dynamics.

Just as today's suites of execution algorithms are proprietarily developed and then externalized to compete and attract users on the basis of their IP, other processes too may begin to be exposed in a similar manner. In those cases, the protocols may be packaged into Dapps that enable usage of the protocol without exposing the underlying code.

In some ways, activities already occurring within many investment managers are paving the way for this approach.

### ***Process Decomposition as a Bridge to Protocols and Dapps***

The decomposition of complex processes into sub-processes or individual tasks has been going on for some time in investment managers' back and middle offices, driven by cost and efficiency considerations and by opportunities for automation. This dynamic is now moving up the value chain and extending into the front office.

In both our Industry Evolution and Industry Revolution reports, Citi's BAS team has highlighted how managers are working to make the investment process itself more scientific. Managers are looking at each investment decision point to understand whether there is an opportunity to improve alpha capture. Many are

progressing in this work to enable the introduction of behavioural analytics that help to optimize specific responses based on each investment team's unique pattern of decision-making.

A parallel set of work is also occurring in many investment managers around how to take their product and solution development efforts and accomplish a similar decomposition of the key workflows to determine how to add efficiencies, build scale, and insert tailoring and optimization algorithms into those pursuits.

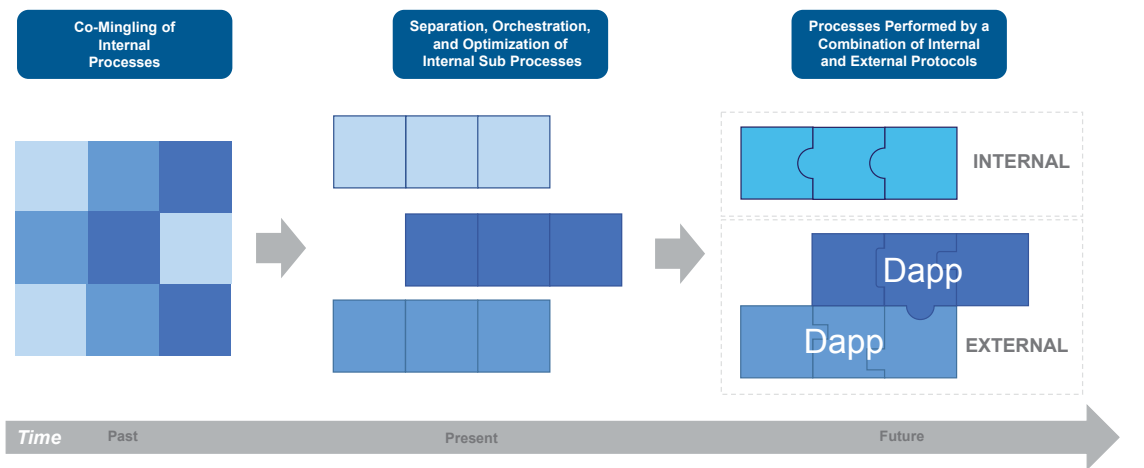
These efforts across investment teams and solution units as well as middle and back office organizations represent a wholesale unbundling of complex and often manual processes. Activities are moving the investment management industry away from its historic cottage-industry approach to a more industrialized future. Cloud-based technologies and AI tools have been driving this shift, allowing managers to isolate and determine what sub-processes can then be performed independently, sequenced, and automated.

This level of decomposition could enable a seamless uptake of some of the new opportunities inherent in Web 3.0. The identification and rationalization of process steps and tasks may set the stage for the targeting of certain of those elements to be re-coded and potentially re-packaged into protocols and potentially Dapps. This progression is shown in Chart 5.1.

An honest and comprehensive assessment of what unique value is created around each process a manager conducts may reveal that there are many pursuits being done within an organization that are undifferentiated. Finding an outside provider able to better fulfil that task and accessing that process via that provider's Dapp may both reduce costs and improve the efficiency of the manager's operations, alpha capture, or solution delivery. Moreover, it would allow the manager to focus in on those parts of the process where they did have unique IP and target their development efforts around those offerings, potentially positioning them to be a provider of that specific process to other organizations.

Combining the art of process decomposition with the new crypto technology toolkit might allow firms to blend internal and external IP in ways not previously possible, allowing for a micro-pursuit of insourcing and outsourcing at a process level. Firms would be able to assess with even greater precision, and at scale, the processes which are core to their own proprietary value creation. For those that are essential, they would protect that code and only externalize it in ways that protects its foundational IP by turning into a Dapp and only allowing access, not transparency. For those which are not, an even greater share of today's investment management processes could be externalized to other providers' Dapps.

Chart 5.1: Evolution of Process Orchestration and Execution



Source: Citi Business Advisory Services

If realized, this shift in approach may drive a series of fundamental changes in the industry across four key areas—firm economics, relationship management, firm identity, and industry structure. Changes in these strategic objectives may alter the future axes of competition.

**“We talk a lot about component creation. Everyone in the value chain is going to have to break down what they provide into individual modules.” - EMEA Asset Manager \$500 billion - \$1 trillion AUM**

**“We would run the investments for other managers but not handle any of the investment mandate stuff.” - EMEA Asset Manager <\$500 billion AUM**

**“In the future an asset manager won’t have as much of a back office or front office trading but they will have a lot more alpha analytics.” - NAM Asset Manager <\$500 billion AUM**

**“The most important thing for the asset management community is to consider what segments of the market would be important for them to be owned in the value chain.” - EMEA Asset Manager \$500 billion - \$1 trillion AUM**

### Envisioning a New Competitive and Cooperative Playing Field

The current trajectory of the industry is driving a split in the competitive dynamics. Some firms are moving toward becoming large investment and solution plat-

forms that can handle a range of client types, investment strategies, tailoring approaches, and distribution arrangements. Other managers are retooling their organizations to become *alpha building blocks* basing on the differentiation on their investment process and results and often limiting their capacity in order to concentrate their impact and preserve their fees.

In advising industry participants, the BAS team often has spoken about the likelihood of an emerging partnership between these models. Adoption of Web 3.0 principals enables us to now try and put more structure around how that might occur and what changes that might entail.

### Network Effects May Drive Economic Considerations and Spotlight Where Value Gets Created

One of the key learnings from the DeFi experiment within the crypto domain is that in a world where users can freely choose across a multitude of Dapps offering similar services, those that attract the most attention and that are able to activate their own version of a network effect are the winners. The importance of an asset achieving virality as discussed in Section III holds true. As more users participate and are rewarded for participating, the more their stake in the Dapp increases in value and the less likely it becomes that the user will switch to an alternate provider.

Value in the network is mutualized, and the network effects become a self-driving force. New entrants want to join the pool where the most value is being created rather than take a risk and hope that a new center of gravity emerges. This draws in even more interest and attention which in turn makes the stakeholders in the Dapp even more vested in its success.

When we apply this dynamic to a potential future for the investment management industry, there are several observations that become clear. These include the following:

- **First Mover Advantage:** With FinTech advancements, little of the success model depended on being a first mover since most organizations preferred to wait for the ecosystem to develop before picking a winner and for the models to be tested before committing to adopt and integrate new capabilities. That may not be the case in a world driven by Web 3.0 dynamics. Network effects kick off as soon as users start to participate with a Dapp. If three KYC/AML protocols are running, a new user is likely to join the one with the most participants. That is because in an environment based on network effects, use is equated with “conviction”.
- **Tying of Incentives to the Process:** Today, there are only a few processes that an investment manager can externalize and obtain compensation. Even then, this is typically done via commercializing the underlying technology platform, not the algorithm or the model. Creating a protocol and offering access via a Dapp offers a different path. Providers could create a utility token that requires a user to purchase access. Payments would then be able to move at the atomic level of the transaction and be assured through the prior purchase of the token.
- **Trackability:** Because the transactions involving the Dapp are on a blockchain every use of a manager’s Dapp will be transparent to the provider and users that participate as nodes. This will make it possible to administer the utility token program without adding any additional processing requirements. The token becomes the cost of entry to the ecosystem. Micro-flows of tokens might then replace the need for firm level netting of activities or fixed pricing arrangements and help to automate and make revenue collection a real-time pursuit.
- **Protected Delivery:** While protocols are usable by anyone who is permissioned for the Dapp, it is important to stress that an investment man-

ager ecosystem is unlikely to rely on open source protocols. Dapps enable users to access another manager’s IP without the manager revealing or selling that IP. Participants could use a Dapp and combine protocols without being able to extract or appropriate the IP contained within them.

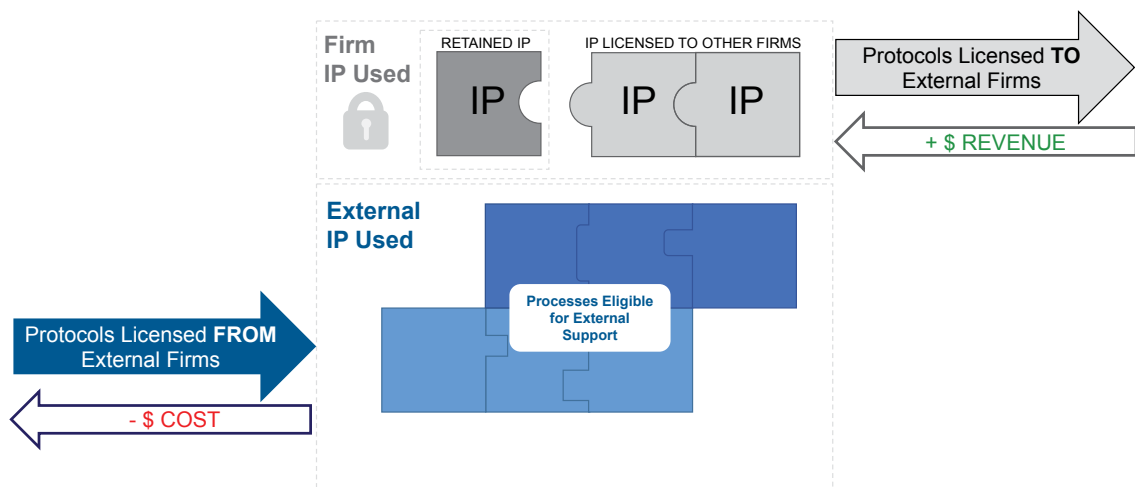
- **Issuance of Participation Rewards:** Implementing a participation reward system and giving additional tokens to those that create value by utilizing the system starts to create stickiness. The user’s average cost of service goes down the more that they use the Dapp since the tokens they spend get supplemented by the tokens they earn, reducing the replacement cost of acquiring more tokens to access the service. This creates stickiness and a competitive advantage as those Dapps with the most utilization will have the largest token pools based on the volume of transactions and thus should have the lowest average cost per token.

The most immediate consequence of the replacement of the industry’s potential shift from proprietary processes to protocols and Dapps may thus be the separation of *value-adding processes, which utilize a firm’s IP*, from undifferentiated activities that do not. This should enable managers to increase their focus on the former while reducing the economic drag of the latter.

There are two parts to the resulting dynamic: the reduction in headcount and fixed cost as a result of being freed from having to support processes where the manager has no competitive advantage; and the ability to selectively monetize their own IP in areas where they *do* have a competitive advantage relative to other firms by licensing their protocols through Dapps with utility tokens.

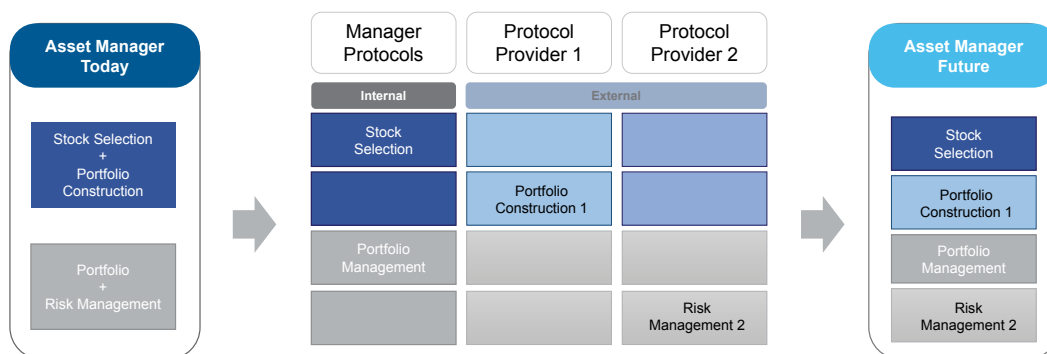
This results in a manager being able to choose to export IP in areas where they have an advantage over

**Chart 5.2: Processes Performed by Combinations of Protocols**



Source: Citi Business Advisory Services

**Chart 5.3: Sourcing Asset Management Protocols Internally and Externally**



Source: Citi Business Advisory Services

other firms, while importing IP in areas where they lack a comparative or competitive advantage. This is an improvement in the quality of their output, while simultaneously reducing their fixed costs by no longer having to support processes unrelated to their IP. Chart 5.2 illustrates this new sourcing approach.

As a new balance is struck between the use of internal protocols and the outsourcing of certain processes to external Dapps, those managers able to offer Dapps for high demand functions and create an incentive structure that rewards others for participating are likely to be the ones that succeed, regardless of whether the Dapp is provided by a platform firm or a dedicated alpha generator. Indeed, the types of Dapps that each might produce could be equally as valuable to the other, depending on where the user see gaps or opportunities relative to their own offering. This is illustrated in Chart 5.3.

The economic dynamics depicted should be mutually reinforcing: using external IP for processes where they lack internal IP, and thereby reducing fixed costs, should enable a firm to focus on the improvement of *their own* IP. This allows for the development of *new* IP, leading in turn to the generation of *more* revenue, which in turn might allow the firm to improve the bottom line.

**Financial “Coopetition” and the Monetization of Relationships**

The model above describes how different types of investment managers may engage with each other to access protocols and Dapps in order to deliver their expertise in a more effective manner. Yet, this level of “plumbing” might be just tier one of the new system.

Delivering investment expertise to end clients may require that investment managers create another set of cooperative arrangements with a variety of different providers, each offering Dapps that encapsulate the unique IP and value proposition that a manager may require to enable the delivery of their investment services. As discussed at the end of Section IV, growing cooperation between banks, wealth managers, and investment managers at a minimum would be required

to enable the management of all the assets held in a consolidated wallet.

More types of participants may also join such ecosystems, each focused on their unique value proposition. Market data providers may transition to enabling platforms, providing Dapps that allow companies and governments to act as creators and directly mint, manage, and monetize their own financial and ESG data as unique tokens that get priced in data marts; social media platforms may offer their own version of automated market maker Dapps for the exchange of micro-assets. There is no limit to how many different types of participants might become an integral part of enabling the successful management of an investor’s expanded set of assets. A vast and complex web of blockchains and relationships may emerge.

Just as utility tokens may enable commercial exchanges between this varied set of players, governance tokens may enable “coopetition”, creating financial incentives for participants to work together. All those in an ecosystem could augment commercial relationships with the additional owner/manager dynamics that proto-companies in the crypto space are experimenting with. Each participant may want to own governance tokens in the Dapps that they use most often in order to ensure that they get a say on key decisions involving the evolution of that offering. The more they participate, the more rewards they would earn and the more influence their votes would have on deciding strategic questions.

Unlike the DeFi version of governance tokens, it is unlikely that 100% of the decision-making will be delegated to the community of governance token holders. Commercial Dapps are likely to keep the majority ownership of their governance token pool so that their board, management team, and employees remain empowered. Yet, opening up a portion of the pool to anyone that wants to participate might create a community effect that would make the relationships not only transactional, but would enable the mutualisation of benefits and growth. All the holders of the governance tokens would benefit when a Dapp succeeds and builds its network effects.

Chart 5.4 shows how utility and governance tokens may enable a new system of Dapps—one helping to attach financial incentives to the delivery of the service and the other helping to ensure that the community supporting the service benefits from its growth in participation.

### Brand as a Cornerstone Competitive Capability

If such an ecosystem were to emerge, brand may become an important new selling point, even more so than in the current TradFi world. Architectures built on smart contracts and blockchains enable a “trustless” system where the code becomes the user’s counterparty as described in Section II, but ironically in the case of investment management, the emergence of such a system may actually cause the importance of trust to rise.

This is because a trustless system is also a *relationship-less* system, and when it comes to money and assets, there is an inherent human desire to have a relationship with entities that manage those resources, regardless of whether it is a person, algorithm, protocol, or Dapp. Indeed, humans have millions of years of embedded emotional and psychological programming when it comes to this basic need. Established managers may find themselves singularly well positioned to leverage their regulated status and brand to become trusted nodes in a future NewFi ecosystem.

Trusting the *technology* is different from trusting an individual or an organization. Crypto models may obviate the need for trust between participants, but that should not be conflated with the idea that nothing can go wrong. Smart contracts in particular lack an

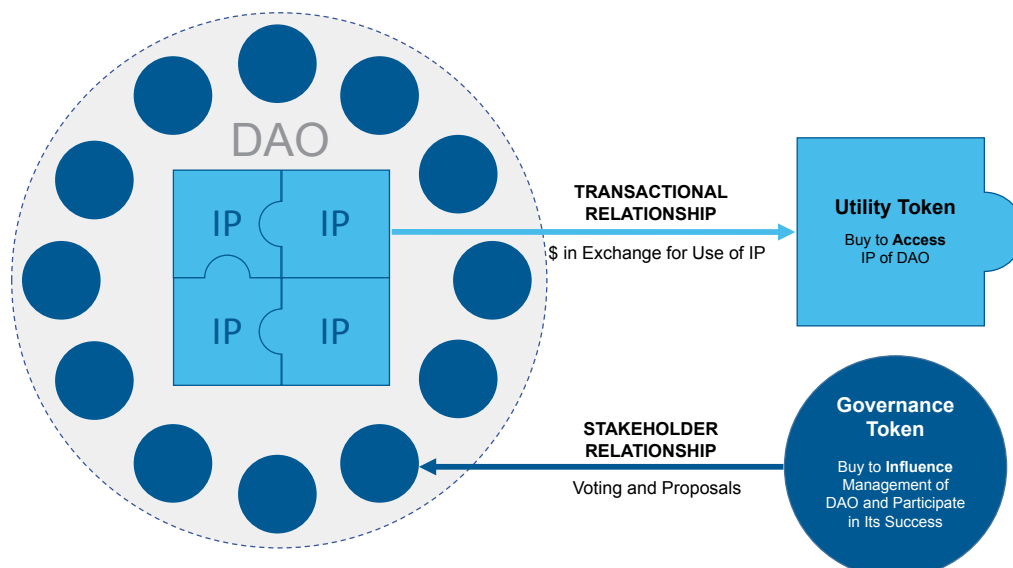
established body of case law about the enforceability of code-based clauses and repercussions of potential failures or fraud.

When something *does* go wrong people want confidence that there is some form of recourse. Firms with a reputation to protect have additional motivation to do the right thing for their clients to protect their relationships over the long term. That implicit assurance does not exist in the same way when your counterparty is anonymous code.

The foundation upon which that trust is built, however, may shift. Already, the industry is grappling with the challenge of how to benchmark performance as portfolios become more tailored to the institution or individual client. Generic benchmarks that have historically measured performance relative to an index to gauge a manager’s skill are being reassessed as the industry develops the capabilities to target portfolios to achieve a multitude of different outcomes and to tailor holdings to specific investor needs. The “process” that is viewed as defining success is changing and thus the *measure* of that success is also shifting.

A similar change might be anticipated if the industry begins to decompose key investment management functions into protocols and Dapps. Investment managers’ brand may then be based around the strength of the community they are able to build—reflecting the notion that conviction equals value. Just as managers today look to differentiate their fund performance or solution design, they may in the future base their reputation on the constant improvement of their protocols, much in the same way that software and app providers do today, but coupled with a focus on community

Chart 5.4: Utility and Governance Tokens Enable Different Types of Interactions with DAO



Source: Citi Business Advisory Services

responsiveness that would represent a completely new dynamic. In a sense, this would take the emerging model of stakeholder capitalism and embed it into the industry's competitive dynamics.

The concept of "community value" may also become increasingly important for another reason. Investors will still need a "gateway" where they trust a provider to have selected the optimal set of Dapps to enable the breadth of their financial lives. Competition as to what entity provides that gateway may be intense as banks, wealth managers, investment managers, and consumer platforms all compete to be seen as that trusted entity. Anyone can select a set of Dapps to perform a range of functions and position themselves as the trusted entry point, but the investor needs to trust that the platform knows how to not just facilitate access to services but navigate them in a manner to achieve the goals laid out at the end of Section IV.

Today, there is widespread concern that a consumer platform may become the entry point to individual's portfolios and that investment managers will be forced to plug into those platforms to ensure distribution. A growing acceptance of crypto models and the emergence of a more decentralized financial ecosystem may shift that power dynamic. Just as consumers go to a shopping platform like Amazon or those desiring community go to a social media platform like Facebook, in the future those desiring a financial partner may pick a platform able to deliver a unique combination of banking, investment, and asset management—all of which could be sourced by any entity engaged in the space.

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***"The more noise there is, the more you have to go to trusted party." - Consultant***

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***"DeFi wants to deliver the manufacturing side of financial services." - DeFi Protocol***

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***"If you listen to all the DeFi community they say everything will be decentralized, but I think that's only going to be true for a small subset. Most of us like convenience and we trust big brands. In the US you trust law. In emerging markets you trust the brand and not the legal process. The big brands have huge power because they are known." - Citi***

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***"I still think that people will subscribe to protocols because of their brands." - NAM Asset Manager <\$500 billion AUM***

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## Conclusion

The roles that investment managers are set to play in this transformed world could change, driven in large part by shifting technologies and macroeconomics that bring together the TradFi and NewFi worlds. At a firm level, the applications of these new technologies opens up previously impossible pathways of monetization, and a potential transformation in the value that asset managers may be positioned to deliver to investors.

## Future Roles

Managers may continue to evolve and expand the role they play in the industry, extending their journey to encompass security selection, fund creation, solution design, and perhaps soon, protocol and Dapp development. Client engagement may shift from a transactional to a community-focused mandate with managers as focused on enabling network effects in the future as they are on delivering outperformance today.

What they manage may extend to encompass not just the equities, bonds, and alternatives that make up TradFi today, but the entire set of NewFi assets as well—digital tokens, physical tokens, payment coins, CBDCs, and potentially other innovations emerging from the crypto experiment. How they manage those assets is also likely to expand from simply investing them to also creating, facilitating, and optimizing the entire set of assets held by an individual or an institution. Brand may become an increasingly important element of the competitive strategy of any manager, irrespective of their role, specialism, or size as trust takes on increased importance in a trustless decentralized ecosystem.

The community that the manager builds and the protocols and Dapps that they offer will vary significantly from firm to firm. The end-to-end set of capabilities in the industry may open up in a manner previously unimaginable and offer managers opportunities to compete around their unique areas of specialty. Such specialties could span research techniques, portfolio construction and management, execution, risk oversight, solution design, tailoring and personalization, middle office services, back office processing, data management, and more. The ability to combine the best of an organization's IP with the best of their peers offerings could result in a mix and match approach to enabling the organization that might position not only protocol and Dapp development, but capability sourcing as a competitive differentiator.

Protocols might open the door for an organization to consider the breadth of today's development efforts in a new manner, as capabilities can be extracted from both investment manufacturing and solution assembly platforms.



Whether a manager chooses to compete as a process enabler, a gateway/navigator or both, those that are able to establish themselves as first movers may have an edge as the ability to achieve network effects and virality is as much based on conviction as it is on capabilities. Coming out with a better offering after the fact may not have the same impact that we have seen in the TradFi world. The NewFi world may require a firm to take a leap of faith and move outside their comfort zone rather than waiting for the weight of industry acceptance to make a move more palatable.

### **Future Economics**

Today's investment ecosystem operates with a large number of intermediaries, central authorities, and complex money transfers at the firm level, based primarily on a model of netting out activities at the end of each trading session. As the world moves toward 24/7/365 markets, CBDCs, private network coins, cryptocurrencies, blockchain, and smart contract enabled platforms, the regulatory framework is likely to evolve and a foundational shift in how the industry operates may occur. At its highest level, this shift is from sequential activities to simultaneous activities and from groups of transactions to atomic transactions.

The revenue collection mechanisms are likely to change in line with this revolution. Collecting micro-payments as an embedded part of a transaction would transform the nature of the industry, highlighting networks with the biggest volumes and largest community of backers. Cooperation between providers with complimentary or required capabilities is likely to take the form of not only financial, but governance partnerships that provide the community a voice in the future development and direction of their critical providers.

Whether one is intrigued, engaged, or outright sceptical of the DeFi space and their accompanying DAOs, understanding how they operate is going to be important as these are the real-life proofs of concept emerging from the Web 3.0 toolkit.

### **The Bottom Line**

For incumbents, the trends outlined in this paper bring with them the prospect of more scalable customization and significant reductions in fixed costs, but also the danger of extra-industry competition and intra-industry competition shifting in a way that will relegate to the side-lines those who have not developed the necessary technological backbone and community-focused mindset.

The threat from uncontrollable innovation originating *outside* the industry and the prospect of competitive threats *not* centred on investment management expertise will challenge managers to disrupt parts of their current businesses and ways of operating before they lose the initiative and are forced to change according to someone else's timetable. To remain industry leaders, today's winners will need to look at expanding their focus and developing new capabilities to navigate the changing competitive realities and capitalize on the opportunities within them. Managers will either meet the demand from retail and institutions to provide them with advice, access, and exposure to digital assets and digital economy investment opportunities, or someone else surely will.

Our hope is that this paper will help clients understand how the DeFi and crypto worlds are redefining the future of investment management from the *outside*—as opposed to the usual model where change comes from within the industry—and how the dynamics of competition might change significantly as a result. Moreover, we want to highlight that there is a growing set of retail investors that are not satisfied with the breadth of opportunities they are being provided by today's TradFi participants and that an exclusive focus on optimizing how to deliver equity and bond portfolios to these individuals may prove to be short-sighted.

As always, Citi's Business Advisory Services team thanks those who shared their insights with us and helped us speculate on what the future of the industry may portend. Challenging our client base to not become complacent and to always be thinking about ways that they might need to adjust, reorient, or transform their capabilities continues to be our primary goal in creating these industry revolution reports that force us into the role of trying to spot potential paths of disruption. As always, we stand by in Business Advisory Services to help you define and recognize both the risks and the opportunities in the emerging world, and safely navigate your business to and through that future. If you would like more information on any aspect of this report, please reach out to your Citi Sales or Relationship Management coverage team or contact us directly at [Business.Advisory@citi.com](mailto:Business.Advisory@citi.com).

# Appendix

## Bitcoin

Bitcoin's concept was first released in a technical white paper in 2008 by an anonymous person or group of people under the name Satoshi Nakamoto.<sup>1</sup> This white paper led to the creation of the world's first decentralized global payment network that was accessible to anyone with an internet connection. The Bitcoin blockchain was innovative because it solved the double spending issue that previous decentralized networks had not solved yet via the creation of a comprehensive ledger that contained every single transaction in the network's history and was distributed to all users. The ledger is called a blockchain and in order to add another block to the chain, separate 3<sup>rd</sup> parties called miners need to verify transactions and solve a complex mathematical problem through a process called proof of work. Miners are compensated for their work through the minting of new Bitcoin. However, the creator/creators also engineered digital scarcity in the protocol by limiting the total amount of coins that could ever be created to just 21 million.

Over time the thinking evolved around the uses of Bitcoin as shown in the model below.

- *Payment:* While originally thought of as a payment network, the volatility around Bitcoin kept

it from gaining too much traction in the payment space.

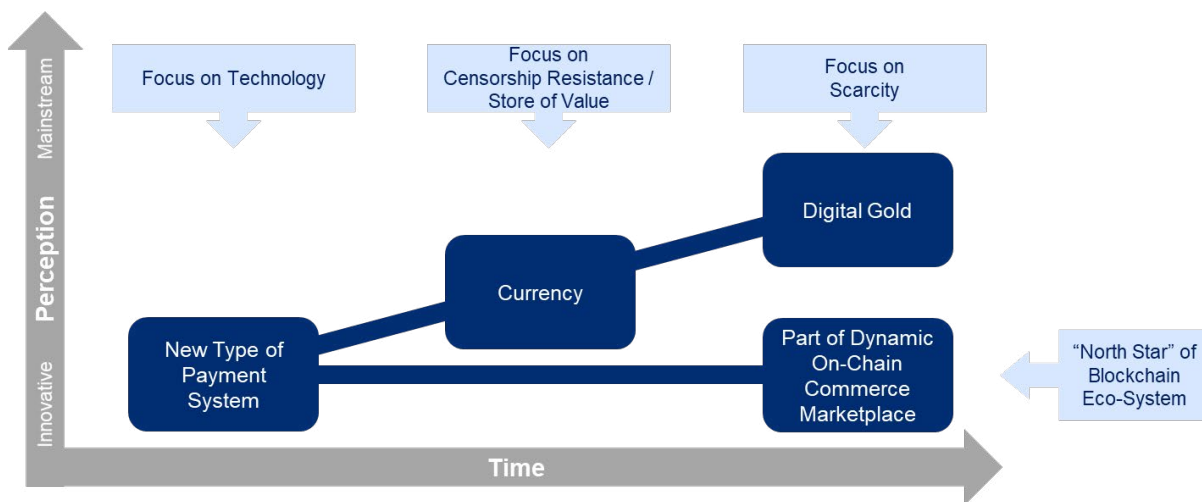
- *Currency:* Countries in emerging markets that don't have a lot of financial infrastructure built out have used Bitcoin to send money cross border to avoid paying high transaction fees.
- *Digital Gold:* As adoption grew, many people recognized Bitcoin's finite supply and started viewing Bitcoin as digital gold. A growing number of investors utilize Bitcoin as an inflation hedge and store of value.

Institutional adoption of Bitcoin is increasing and now 2 of the top 5 asset managers already have an offering around it.<sup>2,3</sup> Over a decade later, we have thousands of crypto currencies, but Bitcoin is still the largest and most adopted, and many in the crypto space view Bitcoin as the North Star for future innovation and adoption of crypto currencies.

## Decentralized Applications (Dapps)

Decentralized Applications, also known as Dapps, are automated applications that operate on top of a blockchain protocol. Dapps can be built on many different blockchains, but Ethereum is by far the most popular

## What is Bitcoin? Inspiration & Barometer for Expanding On-Chain Commerce



Source: Citi Business Advisory Services

1 "Satoshi Nakamoto Released the Bitcoin White Paper 11 Years Ago Today", Coin Cloud, October 31, 2019, <https://coinccloud.medium.com/satoshi-nakamoto-released-the-bitcoin-white-paper-11-years-ago-today-9c2a253b86ff>  
 2 "World's Largest Asset Manager BlackRock Is Trading Bitcoin Futures", Nina Bambysheva, Forbes, April 1, 2021, <https://www.forbes.com/sites/ninabambysheva/2021/04/01/worlds-largest-asset-manager-blackrock-is-now-trading-bitcoin-futures/?sh=7500bf3436ce>  
 3 "Fidelity's bitcoin custody business has been 'incredibly successful,' says CEO", Yogita Khatri, December 14, 2020, <https://www.theblockcrypto.com/post/87624/fidelity-bitcoin-custody-incredibly-successful-ceo-interview>

development platform for Dapps. Since the protocol is a peer-to-peer network, there are no central intermediaries that control the application. Instead the application relies on preprogrammed smart contracts (software) to perform the designated functions and act as intermediary between each party. Popular Dapps perform traditional financial functions like borrowing & lending, market making, and insurance. Today's developers also aspire to build decentralized versions of today's most widely used apps such as Amazon, Airbnb, and Facebook. Dapps in the DeFi space have seen a surge in volume in the last year, and the total value locked in DeFi as of May 7<sup>th</sup> was over \$79 billion and popular protocols such as Maker and Aave had over \$13 billion and \$11 billion total value locked respectively.<sup>4</sup> Total value locked measures the amount of assets locked in the smart contracts of a specific Dapp and indicates the level of activity.

## Decentralized Autonomous Organizations (DAOs)

A DAO is an organization that runs on a predetermined set of rules encoded into a smart contract. Investors can participate in its funding phase when said organization sells tokens in exchange for capital, usually in Ether, to fund its development. Investors in turn get stakes in the company and voting rights that allow them to influence the way the DAO operates. After the funding period, the DAO is deployed and becomes fully autonomous. The code it runs on will be difficult to alter, yet it can be viewed by anyone. All the rules and financial transactions are also recorded on the blockchain so they are transparent and immutable. Everyone who bought a stake in the DAO can make proposals on how and where the DAO should spend its funds by making a monetary deposit. All stakeholders then vote on the proposal, which is implemented if it reaches a majority that can be specified in its code. The DAO model has received a lot of enthusiasm and also faced criticism. It is already receiving regulatory attention despite being at a very early stage of development. On April 21, 2021, Wyoming signed Bill 38 into law to permit DAOs to incorporate under certain conditions as LLCs.<sup>5</sup>

## Decentralized Exchanges

Decentralized exchanges were one of the first types of Dapps built on Ethereum blockchain and they remain amongst the most popular ones in use today. There are three main types of decentralized exchanges: on-chain order books, off-chain order books, and automated market makers (AMMs).

- *Off-Chain Order Books*: Still utilize a central intermediary to maintain an off-chain order book that matches buyers and sellers (e.g., Binance Dex).
- *On-Chain Order Books*: All orders are maintained on the blockchain and verified by miners but still match buyers and sellers (e.g., Bitshares).
- *Automated Market Makers (AMMs)*: Create a market through the use of liquidity pools. The liquidity providers are incentivized to put assets in the pool which help to create stronger liquidity for less liquid markets. Instead of relying on buyers and sellers to set the price, AMMs use a mathematical formula to set the price of the coins. (e.g., Uniswap, Curve Finance, and Sushiswap).

AMMs have gained prominence in 2020 and seen a surge of volume. Uniswap is a prominent AMM and the protocol saw just over \$522 million in revenue between June 2020 and April 2021<sup>6</sup> compared to Coinbase's annual revenue of ~\$1.3B in 2020.<sup>7</sup> The growth of these popular Dapps has significantly changed the network activity of Ethereum as shown in the two pictures below. The picture on the left shows the Ethereum network in May 2020 before DeFi summer when most of the activity took place on centralized exchanges. However, the picture on the right shows the Ethereum network in March 2021 after DeFi activity surged and these decentralized exchanges and applications began seeing significant volumes.

## Decentralized Infrastructure

Decentralized Infrastructure allows individuals to participate in the building of infrastructure by purchasing and installing a device that provides services, and they are able to collect rewards as others use services provided by the device. One of the early pioneers of this idea is Helium, a company that sells hotspot devices that purchasers could install themselves to provide wireless network for the Internet of Things to Helium's users. Decentralized Infrastructure can also represent source of passive income as a single hotspot could generate a monthly return by compensating infrastructure owners with tokens.<sup>8</sup>

## Ethereum

After Bitcoin was created, many other developers followed in the footsteps of Satoshi Nakamoto and created their own cryptocurrencies based off the original Bitcoin protocol but with different tweaks to the code. However, in 2015 Ethereum was created which would later serve as the foundation for DeFi. Ethereum is

4 DeFi Pulse, Accessed May 7, 2021 <https://defipulse.com/>

5 "State Lawmaker Explains Wyoming's Newly Passed DAO LLC Law", Nate DiCamillo, April 22, 2021, <https://www.coindesk.com/wyoming-dao-llc-law-passed>

6 Uniswap Revenue, Token Terminal, Accessed May 7, 2021, <https://www.tokenterminal.com/home>

7 "Coinbase Prospectus - 114,850,769 Shares of Class A Common Stock", SEC, April 1, 2021, <https://www.sec.gov/Archives/edgar/data/0001679788/000162828021006850/coinbaseglobalinc424b.htm>

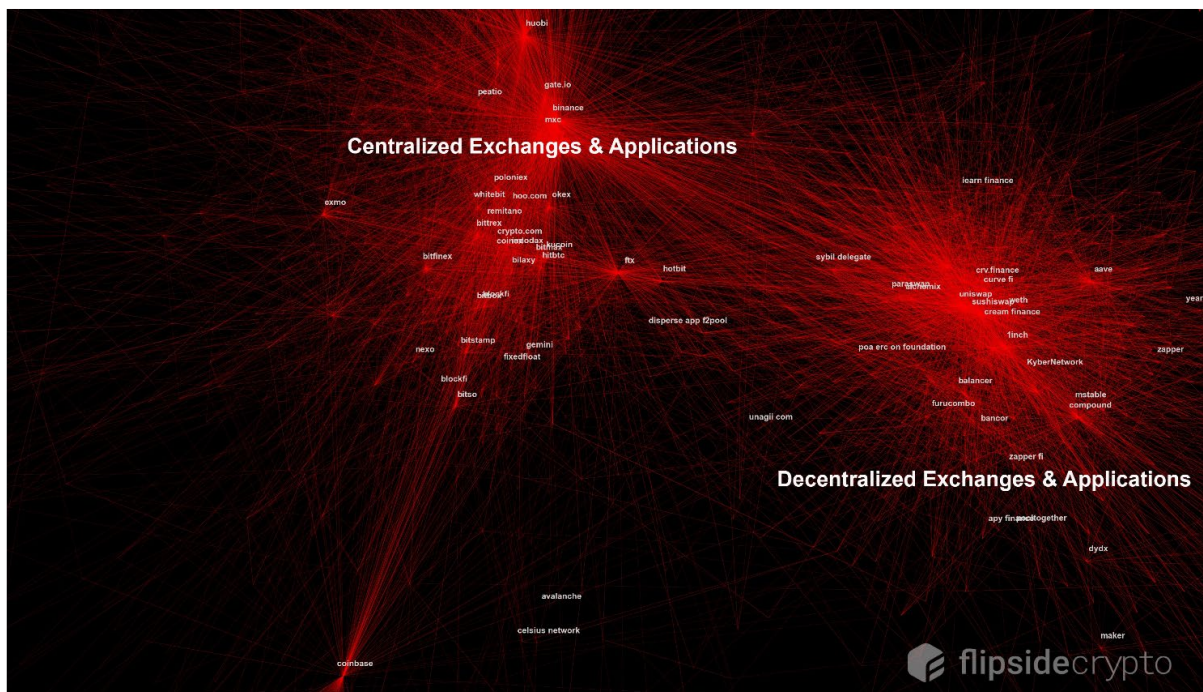
8 "Helium Hotspot Review - Mine Helium HNT cryptocurrency while expanding the IoT friendly LoRaWAN network", James Smythe, Mighty Gadget, April 10, 2021, <https://mightygadget.co.uk/helium-hotspot-review-scam-or-innovative/>

## Ethereum Activity in May 2020



Source: Flipside Crypto

## Ethereum Activity in March 2021



Source: Flipside Crypto

different from the Bitcoin blockchain because it can be programmed and allows developers to build their own decentralized applications (Dapps) on top of the base protocol. To run these Dapps, users must pay transaction fees in the base protocol's coin (i.e., Ether) and these fees vary depending on network activity. It's important to understand the differences between Bitcoin and Ethereum because Bitcoin was originally created as a peer-to-peer payment network, while Ethereum is a development platform as shown in the conceptual model below. Unlike Bitcoin, Ethereum has no cap on the amount of coins that can be minted over time; 18 million can be created annually.<sup>9</sup>

### Flash Loans

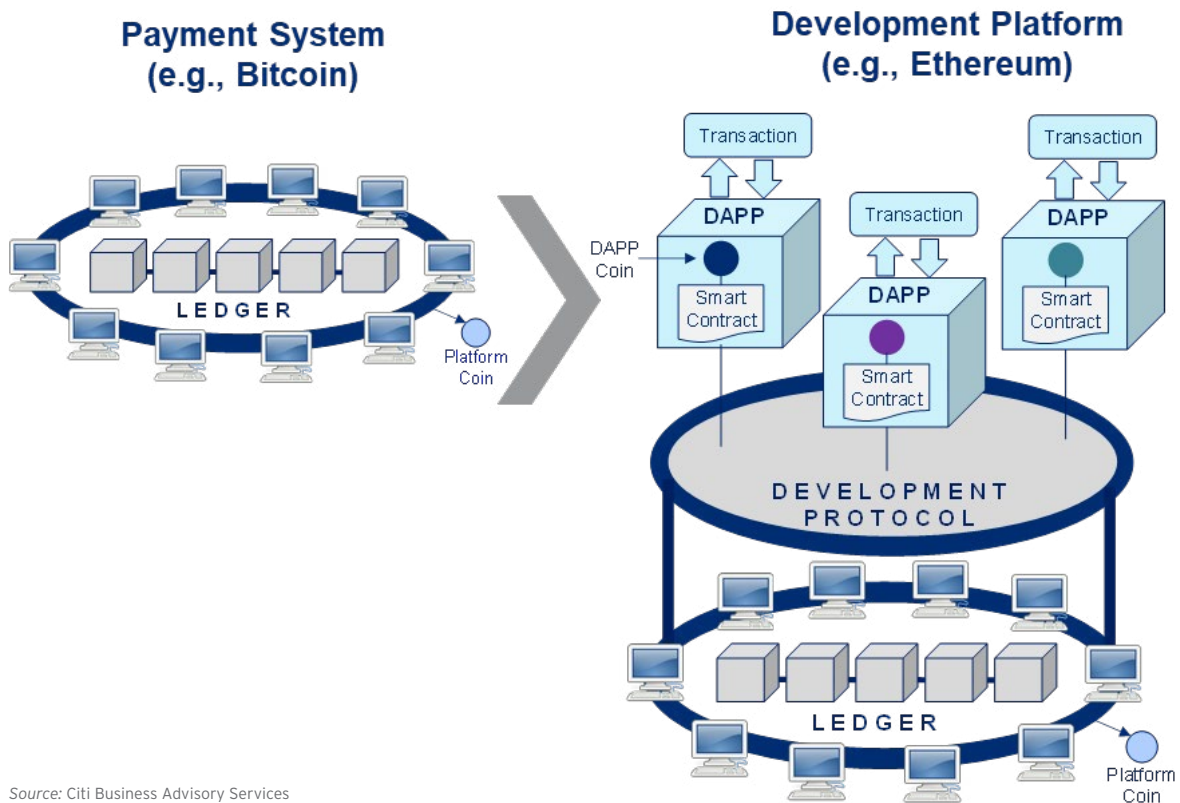
Flash Loans are hyper quick loans that allows borrowers access to uncollateralized loans in the DeFi space as long as they return the capital within one transaction block of the blockchain. Usually these loans are borrowed and repaid within a few seconds. This unique product can allow developers to take advantage of temporary arbitrage scenarios in different

marketplaces with no collateral and very cheap costs (.09%).<sup>10</sup> The Aave protocol enables users to borrow against crypto collateral. It also supports flash loans, and there was just under \$11 billion locked in the protocol as of May 7th.<sup>11</sup>

### Layer 2 Protocols

Layer 2 protocols are solutions designed to increase transaction speed and scalability by handling transactions off the existing blockchain. Users who wish to request a transaction on the blockchain could commit funds to a layer 2 protocol, where internal transactions are occurring and settled without going through the existing blockchain. The protocol then bundles up all the transactions and sends them back to the existing blockchain for inclusion. Users of layer 2 protocols enjoy faster settlement and cheaper transaction costs as miners do not have to process each transaction submitted to layer 2 protocols individually. Popular layer 2 protocols include Ethereum Plasma, Loopring, and the Bitcoin Lightning Network with over \$900 million combined total value locked as of May 7<sup>th</sup>, 2021.<sup>12,13</sup>

### Evolution of On-Chain Models



Source: Citi Business Advisory Services

9 "Why Is Ethereum Co-founder Proposing a Hard Cap?", Rakesh Sharma, Investopedia, June 25, 2019, <https://www.investopedia.com/news/why-ethereum-cofounder-proposing-hard-cap/>  
 10 "Flash Loans: Pushing the Limits of DeFi", Aave, Accessed May 7, 2021, <https://aave.com/flash-loans/>  
 11 DeFi Pulse, Accessed May 7, 2021, <https://defipulse.com/>  
 12 DeFi Pulse, Accessed May 7, 2021, <https://defipulse.com/>  
 13 Value Locked of Ethereum Plasma Solutions, The Block Crypto, Accessed May 12, 2021, <https://www.theblockcrypto.com/data/on-chain-metrics/scaling-solutions/value-locked-of-ethereum-plasma-solutions>

## Lending & Borrowing

Lending and Borrowing in DeFi is similar to those functions in traditional finance with the main difference being that in DeFi these processes are performed by smart contracts, therefore bypassing a central intermediary. In these peer to peer transactions, the smart contract acts as the intermediary and holds all collateral until the loan term has ended. Lending in the DeFi space is also typically significantly over collateralized to prevent against principal loss due to price volatility. Maker and Compound are some of the more successful lending protocols in DeFi with roughly \$10 and \$9 billion locked in the protocol at the end of April 2021.<sup>14</sup>

## Mutuals/Insurance

Decentralized insurance companies are mutual insurance companies by definition since policyholders are the owners of the companies rather than shareholders. They run on smart contracts based on a set of rules that align the interests and incentives for policyholders, claimants, and claim assessors to perform the functions of an insurance company. Pricing of the policies is usually determined by an algorithm. However, popular projects like Nexus Mutual also use human risk assessors who stake tokens against specific risks of early claims to bring down the cost of insurance.<sup>15</sup> Claim assessors also stake tokens that can be locked for longer periods of time or burned if their vote is different from the consensus outcome or if they participate in fraudulent activities. In return, both risk and claim assessors will earn commissions or rewards for performing honest assessments. After voting, if a consensus is reached on a submitted claim, a smart contract will automatically make a payout to the claimant.

## Non-Fungible Tokens (NFTs)

An NFT is a unit of data stored on the blockchain that represents ownership of an item such as artworks like paintings, music, videos, or real world objects like luxury watches and wine. Owners or creators can issue NFTs that will give the ownership of their items to

buyers of the NFTs. In the case of artwork, artists can still retain the copyright and reproduction rights of their artwork, and they can embed royalties into their NFTs, which will allow them to receive proceeds in the event of a resale. All NFTs are unique and are not interchangeable. NFTs have received growing attention in recent months, and one artist named Beeple was able to sell a piece of his work for \$69 million at a Christie's auction.<sup>16</sup> After reaching an all-time high of \$197.51 million in February 2021, the weekly trading volume in NFTs has come down to \$68.53 million as of May 2, 2021.<sup>17</sup>

## Oracles

Oracles can be thought of as the connective tissue between blockchains and the rest of the world. With the advent of smart contracts and decentralized applications, there is a need to for a system to feed information and data from external sources into the blockchains to trigger actions from these autonomous programs. This data can be anything from stock price information to the outcome of an election. Chainlink is the best-known oracle network and it had a market cap of \$15 billion at the end of April.<sup>18</sup>

## Prediction Markets

Prediction Markets have existed for some time, but cryptocurrencies have brought this concept into the public attention, as DeFi prediction markets operate in a decentralized fashion and allow users all over the world to participate. These markets allow users to bet on anything from sports to elections to major world events. Additionally, the DeFi space provides fewer restrictions and lower fees that enable broader participation. Launched in 2018, Augur is the most popular prediction market in the DeFi space and it only charges a 1% fee, which is lower than traditional gambling services.<sup>19</sup>

## Security Token Offering (STO)

A Security Token Offering is also called a tokenized IPO, and similar to offering securities in a traditional

## Main Stablecoin Models



Source: Citi Business Advisory Services

14 DeFi Pulse, Accessed May 7, 2021, <https://defipulse.com/>

15 "Nexus Mutual: A peer-to-peer discretionary mutual on the Ethereum blockchain", Hugh Karp and Reinis Melbardis, Accessed May 7, 2021, [https://nexusmutual.io/assets/docs/nmx\\_white\\_paper\\_v2\\_3.pdf](https://nexusmutual.io/assets/docs/nmx_white_paper_v2_3.pdf)

16 "Beeple sold an NFT for \$69 million", Jacob Kastrenakes, The Verge, March 11, 2021 <https://www.theverge.com/2021/3/11/22325054/beeple-christies-nft-sale-cost-everydays-69-million>

17 The Block Crypto, Accessed May 7, 2021, <https://www.theblockcrypto.com/data/nft-non-fungible-tokens/nft-overview>

18 Yahoo Finance, Accessed May 7, 2021, <https://finance.yahoo.com/quote/LINK-USD/>

19 Augur, Accessed May 7, 2021, <https://augur.net/>

IPO, a security token represents a stake in the issuer. It therefore serves a similar purpose as a security such as equity, debt, or asset-backed securities. STOs use the blockchain to validate and record transactions and therefore enjoy features such as transparency, instant settlement, 24/7 market access, and divisibility. This means retail investors could now purchase a small slice of an expensive asset that they would not have otherwise been able to afford, further unlocking the power of small money.<sup>20</sup>

## Stablecoins

Stablecoins serve as the off- and on-ramps for the crypto ecosystem by allowing a user to translate underlying fiat currency into an on-chain tradeable asset to move assets equivalent to fiat currency around the crypto ecosystem without exposing the user to the volatility of the underlying coin. There are two main stablecoin models that are widely used today which are shown in the diagram below. The first translates fiat currencies 1:1 into an on-chain representation of the underlying fiat currency, with this process often conducted via a central intermediary. The second involves using crypto currencies to peg their value to a reference asset by over collateralizing the reference asset and using the additional collateral to account for price fluctuations.<sup>21</sup>

## Staking

Staking is a process where users validate transactions carried out on blockchains utilizing a “proof-of-stake” approach, by putting their own coins up as collateral. This is reminiscent of mining in blockchains using “proof-of-work”, but involves collateral instead of solving a problem. If a user tries to change the ledger for their own personal gain they will lose the money they have staked.<sup>22</sup> The proof-of-stake model is sometimes viewed more favorably due to lower energy usage compared to the “proof-of-work” model. As energy usage continues to be a concern, popular blockchains such

as Ethereum are looking to transition from a “proof-of-work” protocol to a “proof-of-stake” protocol.

## Synthetic Assets

Similar to traditional markets, DeFi providers have started offering synthetic assets with exposure to various crypto currencies like BTC and ETH and even popular stocks like Google and Tesla. To achieve this exposure, users will purchase tokens that could be staked on the platform in exchange for synthetic assets. The difference between the dollar value of tokens staked and the synthetic assets can be more than 6x.<sup>23</sup> Users of the platform are incentivized to burn or mint synthetic coins to mimic the price movement of the assets that the synthetic assets aim to track and making sure their position is over-collateralized. There are currently several Ethereum-based protocols that offer platforms for synthetic assets such as Synthetix and UMA. Synthetic assets represent an important step toward universal market access where anyone from around the world could trade any financial product domesticated in any countries.

## Yield Farming

Yield Farming, which is sometimes referred to as liquidity mining, is a popular strategy in DeFi. It involves users depositing their coins in a protocol’s liquidity pool and receiving a portion of the fees that the protocol charges their users. These protocols sometimes also distribute another token which can appreciate in value as the network supported by the protocol expands. Yield farmers will actively move their crypto around the DeFi ecosystem and use leverage in search of higher yields to maximize return. The Compound Dapp was one of the early Dapps that popularized the term yield farming as it rewarded token holders with a return and the issuance of their COMP token. Yield farming and the ability to capture larger returns relative to traditional markets has been a large contributor to the rise of the DeFi ecosystem.

20 “What is a Security Token Offering”, Hedera Hashgraph, Accessed May 7, 2021, <https://hedera.com/learning/what-is-a-security-token-offering-sto>

21 “What are Stablecoins?”, Cryptopedia Staff, Gemini, March 12, 2021, <https://www.gemini.com/cryptopedia/what-are-stablecoins-how-do-they-work>

22 “Staking and Inflation on Coinbase”, Coinbase, Accessed May 7, 2021, <https://help.coinbase.com/en/coinbase/trading-and-funding/staking-rewards/staking-inflation#:~:text=What%20is%20staking%3Ftransactions%20and%20earn%20staking%20rewards>

23 “What is Synthetix and How Does it Work”, Kain Warwick, December 10, 2020, <https://www.gemini.com/cryptopedia/synthetix#section-what-is-synthetix>

We would like to thank our interviewees again for their time and for sharing their thoughts with us.

For this paper, we surveyed a broader set of interviewees than in our previous papers, in addition to investment manage firms. As such—with their permission and support—we are delighted to thank the following FinTech and DeFi innovators who contributed their thoughts.

|                           |                                       |
|---------------------------|---------------------------------------|
| Aave                      | Genesis                               |
| ADDX                      | Grayscale                             |
| Alto IRA                  | Maker<br>Foundation                   |
| Anchorage<br>Digital      | MIT Digital<br>Currency<br>Initiative |
| Animoca<br>Brands         | MoonPay                               |
| BCB Group                 | Multicoi                              |
| BlockFi                   | NextWave                              |
| CFTE                      | Nexus Mutual                          |
| Chainalysis               | OSL Exchange                          |
| Coinbase                  | Parfin                                |
| CoinShares                | Republic                              |
| Compound                  | SDX                                   |
| Digital Asset<br>Research | ShieldPay                             |
| Elwood                    | Sygnun                                |
| ErisX                     | Synthetix                             |
| Flipside Crypto           | Uniswap                               |



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